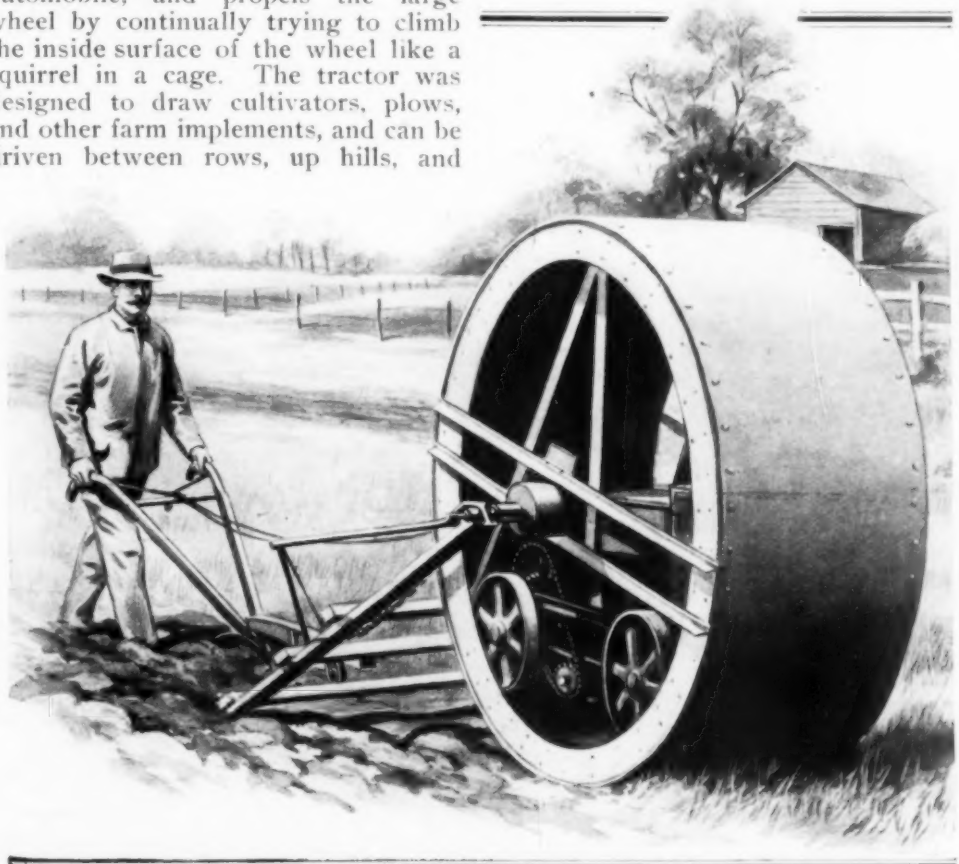
Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 21 FEBRUARY, 1914 No. 2

Rolling-Hoop Tractor for the Farm

A GASOLINE farm tractor which works on the principle of a squirrel cage has been invented and tried out by a Connecticut farmer. It consists mainly of a wheel, 5 ft. 6 in. in diameter, with a tread of 30 in., which rolls along the ground propelled by a 12-15 hp. gasoline engine inside. The motor is mounted on four wheels fitted with gears and a clutch, like a tiny automobile, and propels the large wheel by continually trying to climb the inside surface of the wheel like a squirrel in a cage. The tractor was designed to draw cultivators, plows, and other farm implements, and can be driven between rows, up hills, and around sharp corners; but it can also be geared higher to draw a wagon or buggy on the road. Mounted on a frame or cradle, it can be used as a handy power plant for running corn shellers, etc. Built with a 52-in. wheel, this machine weighs about 1,200 lb., and reports of tests made with it indicate a high degree of efficiency.



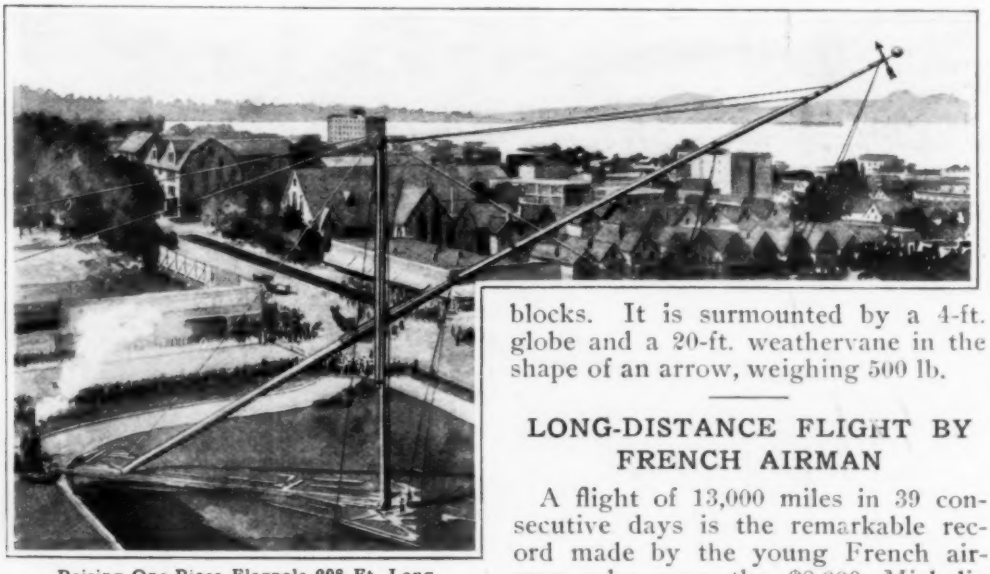
An Engine, Mounted on Wheels, Continually Climbs the Inside and Rolls This Huge Hoop along the Ground to Draw Farm Implements

AERIAL ROPEWAY ACROSS THE ANDES

A steel ropeway, 37½ miles in length, will connect two Colombian cities across the summit of the Andes Mountains, being an extension of a railway already in operation. The ropeway will cross the eastern range of the Andes at a point halfway between Mariquita and Manizares, and at an altitude of 11,000 ft. Power will be supplied by water brought from a higher altitude to the power plant, 3 miles from Mariquita. The ropeway will be built in 12 sections, at each junction point of which a motor capable of handling the load of two sections is to be installed, so that if one motor is disabled, the motors on each side will be able to carry the emergency load, and traffic will not be halted.

ERECTING BIG FLAGPOLE AT VANCOUVER

A flagpole of Douglas fir, 208 ft. high, has been erected in front of the provincial courthouse in Vancouver, B. C. To demonstrate the resources of the timber country, it was decided to secure a single stick of as great length as possible and so erect it as to protect the base from decay. A suitable timber was cut and delivered in the rough to the courthouse in the fall of 1912. Supported on blocks in a horizontal position and turned from time to time, it was left to season for a year. When finally trimmed, seasoned and painted, it was circular in the upper section and hexagonal at the base. A concrete foundation was provided below ground, 12 ft. square and 12 ft. deep, with a square hole in the center, 3 ft. on a side and 9 ft. deep, to receive the lower end of the flagpole. This hole was lined with galvanized iron, which extended above the concrete to exclude moisture. A derrick with an 87-ft. mast was used in erecting the pole, to which the hoisting cable was attached just above the center of gravity. The pole was raised without difficulty, set in the metal casing, and dry sand tightly packed around it, the metal edges being turned and driven into the wood of the pole, effectually sealing the base against dampness. The pole is guyed with eight cables, anchored into concrete blocks. It is surmounted by a 4-ft. globe and a 20-ft. weathervane in the shape of an arrow, weighing 500 lb.



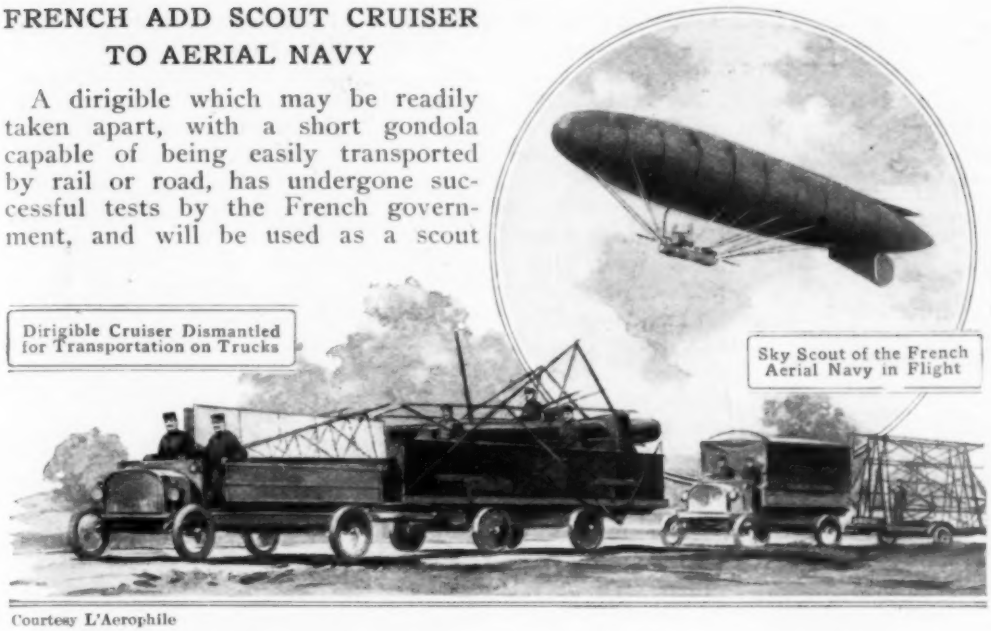
Raising One-Piece Flagpole 208 Ft. Long

LONG-DISTANCE FLIGHT BY FRENCH AIRMAN

A flight of 13,000 miles in 39 consecutive days is the remarkable record made by the young French airman who won the $8,000 Michelin prize offered in France for the longest flight of the year 1913. The flight was made over a cross-country circuit.

FRENCH ADD SCOUT CRUISER TO AERIAL NAVY

A dirigible which may be readily taken apart, with a short gondola capable of being easily transported by rail or road, has undergone successful tests by the French government, and will be used as a scout cruiser in the aerial navy of that country. It is equipped with a horizontal propeller by which it may be lowered within reach of the landing crew without the use of guide ropes. Vertical descents have been made from as great a height as 1,000 ft. by this means, and the number of men required to operate the car is thus reduced considerably. Two vertical propellers besides the horizontal one are provided, and two 90-hp. engines drive the dirigible at a speed of about 40 miles an hour. When taken apart, the dirigible is loaded upon two trucks, each hauled by a tractor. Later models will be so constructed, so it is said, that the gondola will take the place of one tractor. The gas bag has a capacity of about 230,000 cubic feet.



Dirigible Cruiser Dismantled for Transportation on Trucks

Sky Scout of the French Aerial Navy in Flight

Courtesy L'Aerophile

SPECIAL TRAIN USED BY THE GERMAN EMPEROR

Six coaches, each weighing about 60 tons, compose the special train used by Kaiser Wilhelm, of Germany, in his travels. Of these, four are reserved for the Kaiser and his suite and the other two are used for kitchen and offices. The second coach in the train is the one taken by the Kaiser for his personal quarters. This car contains his personal salon, bedroom, dressing room and bathroom, and sleeping rooms for his attendants. The salon is rich in historic associations. It is paneled in the wood of an ancient cedar taken from Mount Lebanon, the gift of ex-Sultan Abdul Hamid of Turkey. The floor is of black wood taken from the piles of a wooden bridge built across the Rhine by Julius Cæsar in the year 55 B. C., while the ceiling is decorated with a design representing the six great rivers of Germany. The two coaches following this car are reserved for the Kaiser's suite, while behind these is the dining car. The last coach in the train is used by the engineer who controls the operation of the train, and who has accompanied the Kaiser on all his railway journeys during the 25 years of his reign. The Kaiser's two dachshunds, Waldl and Hexl, have their regular quarters on the train and always accompany his majesty in his travels.

¶Cast-off clothing and second-hand uniforms of all nations find a ready market in Afghanistan.

BALL-AND-SOCKET JOINT FOR LIGHTING FIXTURES

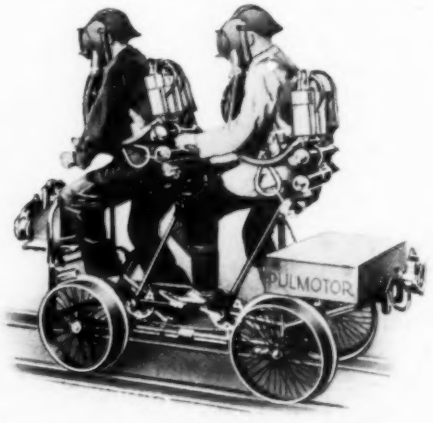
The difficulty often encountered in making electric-lighting fixtures hang straight is overcome by a ball-and-socket joint recently placed on the market. This joint is a part of the base and is tapped at the lower end to receive the threaded end of the pipe on the fixture proper. In installing the fixture, the wireman attaches the base to the ceiling and fits the socket part of the joint loosely over the ball. The fixture is then attached and its weight causes it to swing to a vertical position. The job is completed by tightening the joint with the wing nut and placing the canopy in position.

PRECIOUS STONES GLOW IN VACUUM

The fluorescence of gems has long been observed, but recent experiments with vacuum tubes have developed surprising qualities in the diamond, the ruby and the emerald, as well as such minerals as kunzite. Even in rarefied air some diamonds emit a blue light similar to that of sulphate of quinine under the same circumstances. In a vacuum a diamond of four or five carats emits as much light as a candle. Diamonds from different mines show marked divergence in the colors given off in vacuum. Next to the diamond the ruby glows with a beautiful phosphorescence in a vacuum. It emits a red light, as if it were incandescent. The emerald shines with a crimson light, while kunzite glows with a yellow radiance, sometimes tinged with rose. The same gems glow with phosphorescence under the influence of radium. Experts utilize this test to determine the value and quality of some gems, as, for instance, the rubies of Burma which are more valuable than those from the mines of Siam. Viewed in ordinary light they cannot be distinguished, but under the ultraviolet rays the Burmese stones glow like red embers, while the Siamese gems look almost black.

NEW CAR FOR MINE-RESCUE WORK

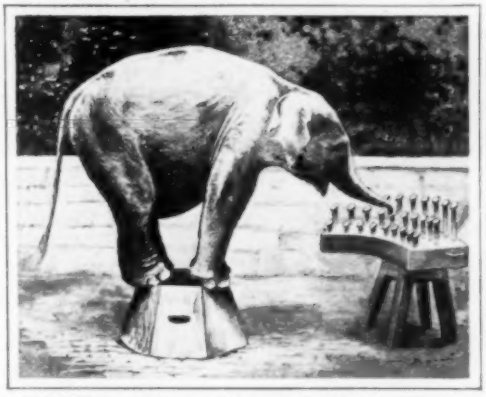
A velocipede car is offered by a German manufacturer with which life-saving apparatus may be quickly taken into a mine where an explosion has taken place. To this end space and weight have been economized to the utmost, and when several cars are called into service each may be readily taken off the track and parked alongside at the terminal. The life-saving equipment consists, besides two pulmotors, of two oxygen containers, four potassium cartridges for absorbing the carbonic-acid gas of the exhaled air, and such tools as are most demanded in emergency.



First-Aid Car for Saving Life in Mine Disaster

AN ELEPHANT THAT USES A TYPEWRITER

There are few offices, even during the busy season, which could use to advantage the typewriter operator shown



Writing a Letter to Friends in the Jungle

in the accompanying picture. Still, a German animal lover who has achieved some notable successes in training horses to "spell" words by stamping a certain number of times with their hoofs, has undertaken to educate this young elephant to take dictation from him directly on a special typewriter. In the case of the horses, there was considerable skepticism as to just how much intelligence was displayed in responding to arbitrary signals. In the writing done by the elephant, while the animal actually selects on the crude machine the proper letters to spell the simple words called to it by the trainer, it must be evident that it only obeys, as in the case of the horses, the voice and tone of command, doing exactly what it has been trained to do, but without understanding the meaning of the operation, or of the words it so promptly writes.

READING ROOMS ON BATTLESHIPS

The new battleship "New York" will have an innovation in the shape of a room especially fitted up for the use and accommodation of the guests of the crew. Reading tables, writing desks, books, papers, and magazines will be provided and "landlubbers," as well as friends from other vessels, may be entertained in comfort when in port. Much has been done to increase the attractiveness of the sailor's life, but the idea of providing an apartment where guests and friends of the fighting force can find enjoyable rest and recreation is a new one on a man-of-war. Similar changes for increasing the comfort of the crew and the attractiveness of the ship for enlisted men and their visitors will be installed on other ships as rapidly as possible.

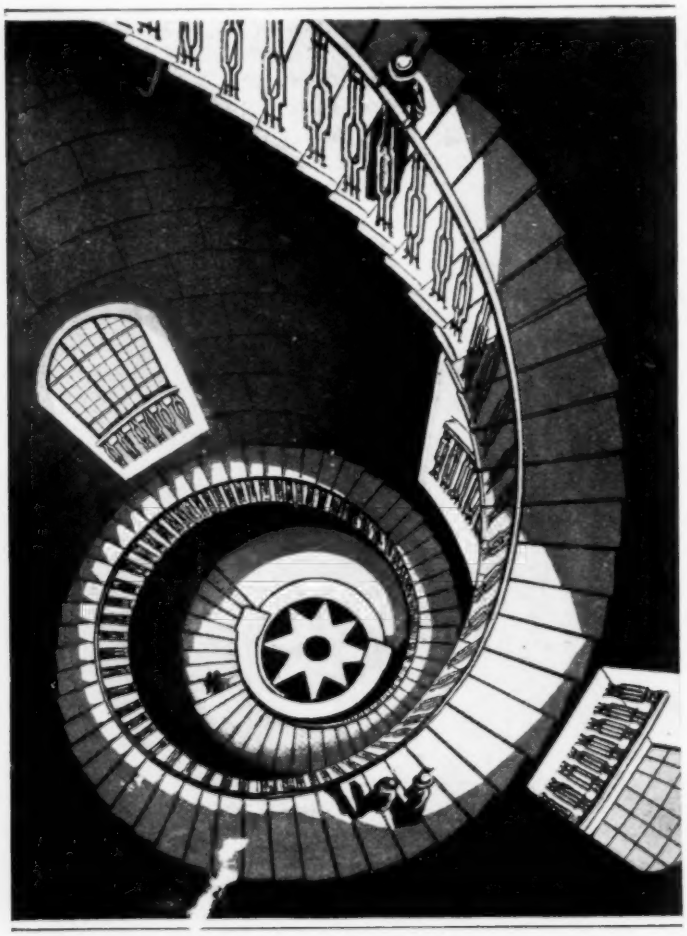
HORNS CLEAR STREETS FOR FIRE ENGINES

The instant a fire alarm is turned in in Oakland, Cal., a warning electric horn at down-town street corners is sounded, clearing the streets for an unimpeded run by the fire apparatus. The horns, driven by a small motor and controlled at the central fire-alarm station, are fastened to the electric-light poles at all corners where traffic is congested, and prove an aid when speedy motor-driven fire apparatus is used.

¶ Panama Canal tolls, as recently established by executive order, are $1.20 per net ton on vessels available for passengers or freight, a net ton being considered as 100 cu. ft. of capacity. A reduction of 40 per cent will be made for ships without passengers or cargo.

A FAMOUS GEOMETRICAL STAIRCASE

Visitors to St. Paul's Cathedral in London are shown the geometrical staircase in the South Tower, one of the triumphs of Sir Christopher Wren's genius. It is a circular ascent 25 ft. in diameter, with stone steps nearly 6 ft. broad at their outer end. At one end the steps are imbedded in the wall, at the other they rest upon the edge of the next lower step, without other support from below.



Perpendicular View of the Geometrical Staircase in St. Paul's Cathedral, London

Early English stairs usually consisted of flights with landings, taking up much room, restricting their use to broad halls. The women of the castle objecting to sharing these outer stairs with the rough men-at-arms, interior stairs were constructed, connecting with the living rooms, by the simple expedient of leaving out some stones when constructing interior walls, and in the wells thus made, placing bricks, short stones or even timbers to form a rude ladder. These crude stairs necessarily took a circular flight, and as improvements were made, the steps became more regular, longer stones being used, until at last a circular stairway was formed, each step of which depended entirely upon the support afforded by the walls, and independent of the others.

The next move was the consolidation shown in the Wren creation, the so-called "geometrical" staircase, where each step rests upon the next lower, the thrust from the outer end being carried into the wall at a lower level. Another interesting specimen of the geometrical staircase is found in Lincoln's Inn Fields, London, built at a later date and probably inspired by St. Paul's.

CUP THAT KEEPS TEA OR COFFEE HOT

A popular novelty recently introduced in France is a cup so made as to keep tea or coffee hot while the user is reading the morning paper between sips. This is accomplished by providing the cup with a double bottom into which a slip of heated metal can be placed. The liquid is kept hot for a period of about twenty minutes.

MAKING PENGUIN OIL IS THE SOUTHERNMOST INDUSTRY

About 750 miles to the southeast of Tasmania lies a barren island having an area of perhaps 25,000 acres. It belongs to Tasmania and is known as Macquarie Island. Upon it is conducted a peculiar industry — the penguin-oil industry. About 80,000,000 penguins—"Johnnies," the sailors call them—make their homes here, and great numbers of this fat, clumsily waddling bird are slaughtered annually for the sake of the oil obtained from it, which is used in dressing leather and in the binder-twine trade.

On Macquarie Island the carcasses are boiled in digesters having a capacity of 800 birds each; steam is applied up to about 25-lb. pressure, when it is turned off and water pumped into the bottoms of the digesters, which causes the oil to rise to the top, from which it is drawn off.

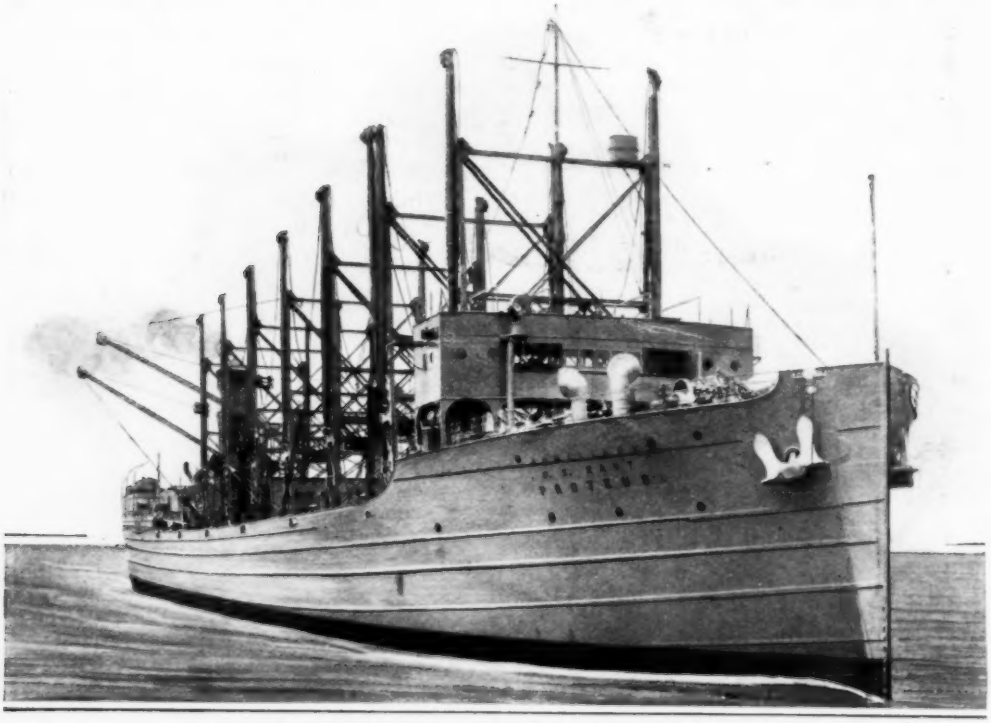
Penguins are found only in the antarctic and the south temperate regions. They can not fly, and look extremely awkward on shore, but when swimming they are quite graceful. In some localities they are so plentiful that more than 225,000 pt. of the oil have been obtained in five weeks. The penguin-oil industry is by no means confined to Macquarie Island, but is carried on also in South America, especially off the Patagonian coast.

BAMBOO GROVE PRESERVED IN ERECTING BUILDING

In order to preserve a clump of bamboo, which is believed to be the largest ever grown in America, a nursery company in Los Angeles, Cal., set its new salesroom, which has just been completed, about 10 ft. back from the street line, thus sacrificing a considerable amount of valuable building space from esthetic motives.

Nursery Building Set Back 10 Ft. from Street Line to Preserve Largest Bamboo Grove in America

NEW COLLIERS FOR NAVY ARE HIGHLY EFFICIENT



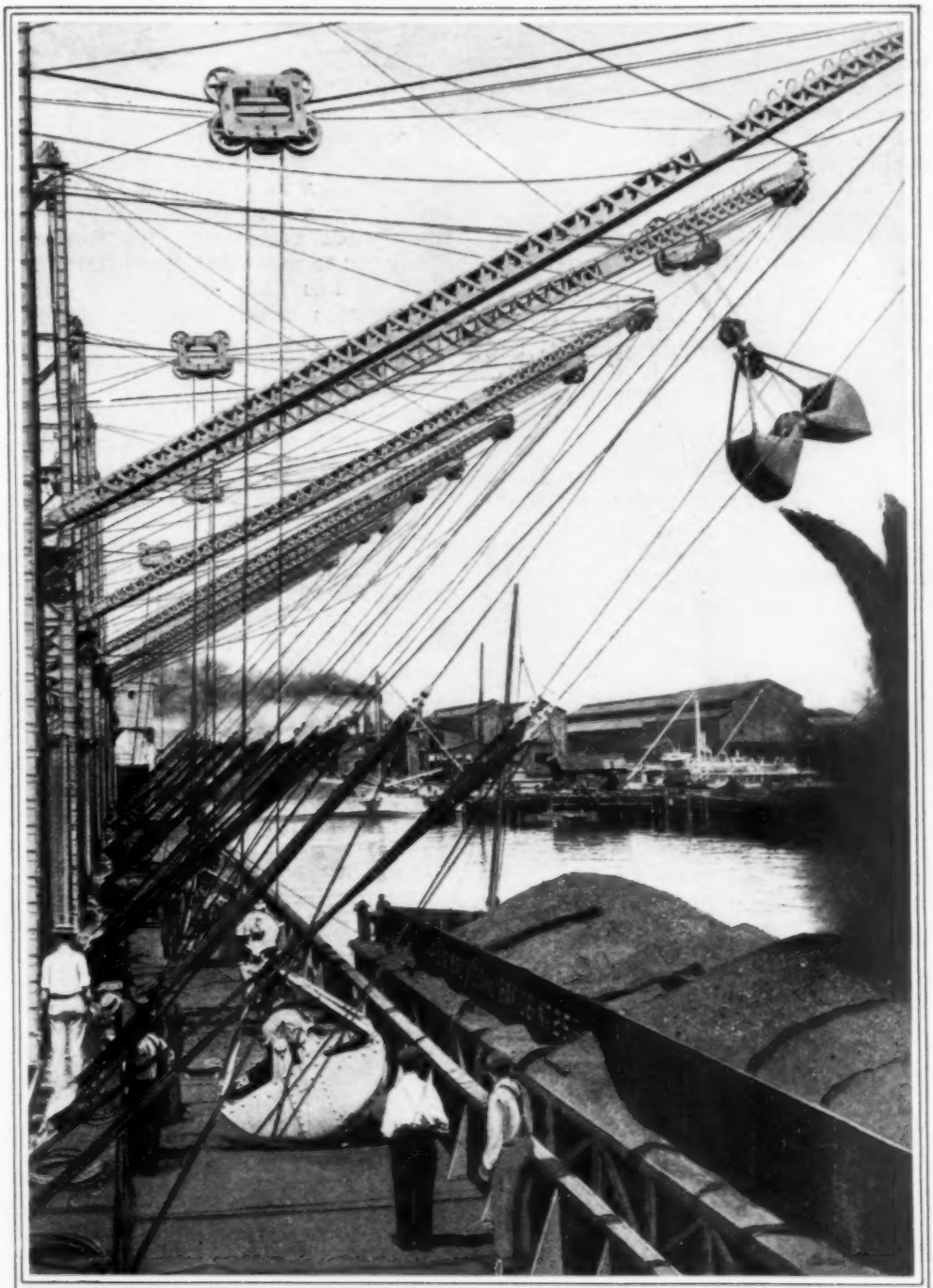
The "Proteus," Latest Type of Collier for the United States Navy

The twin colliers, "Proteus" and "Nereus," of the United States navy, which have just been put into commission, are designed to carry fuel for either coal or oil-burning vessels. These colliers have a cargo capacity of approximately 12,500 tons of coal or 900,000 gal. of fuel oil. In length they are 522 ft.; 62 ft. in breadth, and 40 ft. in depth of hold. They are driven by twin-screw reciprocating engines at a speed of 16 miles an hour, or more than 14 knots.

Each has 14 large hatches and 14 "marine transfers," which, if worked simultaneously, will discharge 1,680 tons of coal per hour. This capacity is sufficient to coal two battleships at once, giving each over 800 tons of coal per hour as long as they can receive it. Placing a collier between two heavy battleships at sea involves much risk, but it has been done, and in time of war probably will occur quite often. The coaling may even be carried on without slackening speed.

The winches used in operating the clam-shell buckets are reversible and so simplified that one man with a pump handle in each hand and one foot brake operates two winches. In this way the 14 hatches require only 14 men to operate. The buckets carry about 1,600 lb. each, and when worked by an expert, can make the round trip from the hold of the collier to the battleship and back to the hold again in 17 seconds. Sometimes the coal is conveyed directly to the bunkers of the coaling vessel, and again it is landed on the deck and is thence carried to the bunkers through chutes or with hoppers, the shoveling and trimming being done by the crew of the vessel receiving the coal.

The United States navy now has a fleet of about 25 fuel ships, of which 12 or 14 might be classed with the "Pro-



A View along the Deck of the "Proteus," Showing Operation of the Equipment for Coaling War Vessels

teus" and "Nereus." Such colliers cost a million dollars each, and each carries more coal than is stored at any one of the government's 11 modern coaling stations.

AN AUTOMOBILE SCISSORS GRINDER

A portable machine shop made out of an old automobile travels the streets of New Orleans grinding knives and scissors. All that is left of the car is the front axle and wheels and the two-cylinder gasoline power plant. A third wheel supports the rear end of the sawed-off frame, and the car can attain considerable speed under its own power. Over the engine is a light work-table with a grindstone belted to a pulley on the engine flywheel. When work is scarce, the scissors grinder takes pleasure rides in his three-wheeled machine shop with his 17-year-old daughter on the narrow seat beside him.

A Scissors Grinder's Traveling Machine Shop Made Out of an Old Automobile

SECRETARY OF NAVY SAYS OIL IS FUTURE FUEL

Secretary of the Navy Daniels declares in his annual report for 1913 that oil bids fair to become the principal fuel of the navy in the future. Already the United States employs it exclusively for torpedo-boat destroyers, and likewise has four battleships under construction which will be equipped with oil burners. Rear Admiral Griffen recommends that Congress empower the Navy Department to undertake immediately the refining of its own oil from oil wells driven on public lands. For, it is urged, as foreign navies are taking up the use of oil as fuel, it will not be long before the consumption for naval purposes alone, when all fleets are equipped, will exceed 25,000,000 tons of fuel oil annually. The world's annual supply of crude oil is now about 60,000,000 tons, of which the United States produces 60 per cent. California, Oklahoma and Illinois supply three-fourths of this.

EYESTRAIN AND THE GLARE OF GLOSSY PAPER

In connection with the country-wide campaign which is being waged against brilliant direct-lighting systems and other kinds of troublesome glare, much study has been made of the glare and consequent eyestrain which results from the use of highly glazed paper in books and magazines. Some persons have gone so far as to recommend that no calendered or coated paper be used in any school books, since glossy paper reflects light rays directly without diffusing them, to save the eyes. The public and the printers, on the other hand, have been demanding more highly glazed paper on account of its richness and

fitness for half-tone work. To prove their point, the antiglare societies have printed a number of pamphlets on mat and even bond paper. While the half-tone work is not so good, beautiful results can be obtained with the offset process, and the higher cost of the paper is compensated for by its lightness. From rough-surfaced paper the study has been carried to tinted paper. Cream and pale-blue tints seem to involve less eyestrain than white paper, and if the tints are alternated throughout a book, each page brings a restful change to the eyes. The thickness of the paper and the presence of too much wood pulp has been considered, along with the question of size and legibility of type. The whole discussion has been brought about by the increase in eye trouble among school children; it is thought that the character of textbooks and copy books is as responsible as poor lighting systems. As a result, many books and magazines are now being printed on machine-finished paper.

SWIMS THROUGH THE PANAMA CANAL

An American professional swimmer swam through 30 miles of the Panama Canal last November, covering this distance in a total swimming time of 16 hours and 35 min. It is estimated that a vessel will require 10 hours for passage through the 50 miles of the entire canal. The swimming feat required parts of two days for its completion. On the first day the 22-mile stretch from Gatun Locks through Gatun Lake to a point near the north end of Culebra Cut, where the swimmer was compelled to leave the water on account of weeds, was covered. Government regulations prohibit swimming in Culebra Cut north of the Cucaracha slide and, after resting a day, the swimmer started again at the south side of the slide and swam to Balboa, the Pacific end of the canal. On this stretch are the Pedro Miguel Lock, passed in 15 minutes, and the Miraflores Locks, where a rest of 35 minutes was taken.

IDEALISTS ERECT SIGN IN NEW YORK

A star illuminated by electric lights in Madison Square Park, New York City, which shines every night in the

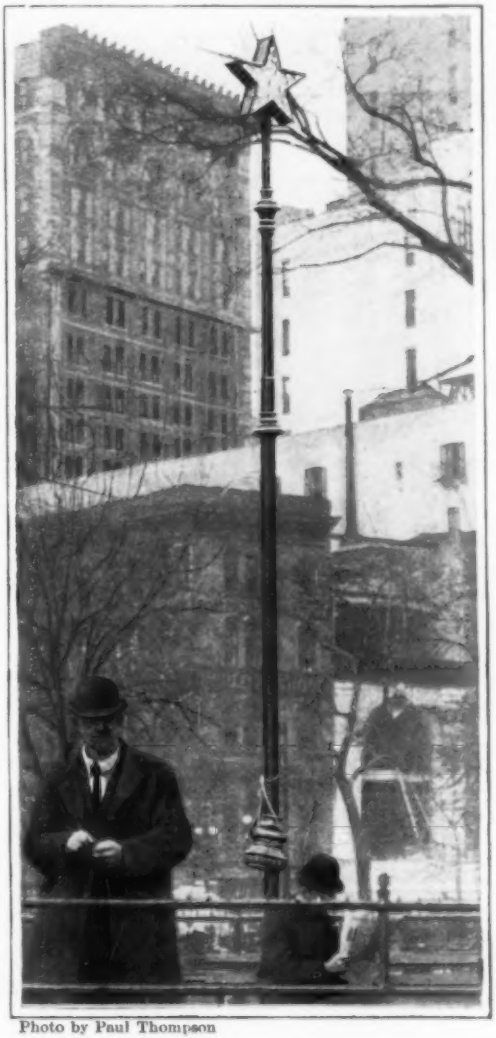


Photo by Paul Thompson

year except during Christmas week, has been erected by a group of idealists who were impressed by the Christmas tree covered with colored lights in the snow-covered square in 1912. When the tree was taken down the park seemed more gloomy than ever, and it was suggested that the tree be replaced by a star which should shine as an emblem of hope, peace, and good-

will throughout the year. During each Christmas week the great Christmas tree will shine forth its message with music, lights, and cheer.

NEW BELT DESIGNED FOR USE OF AIRMEN

A new belt has been designed for the use of airmen, consisting of a wide piece of leather for the front, secured

Courtesy of The Sphere
New Belt Holds Fast and Lets Go Quickly

by side straps and strong rubber cords to the back of the steering seat. These cords are very strongly made, but have enough elasticity to take off the shock of sudden stoppage. The airman may release himself quickly by pulling out one of the pins holding the side straps in place.

NEW RADIUM PREPARATION MAKES METALS LUMINOUS

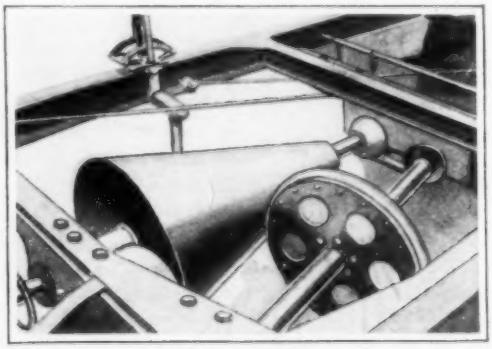
A German chemist has succeeded in producing a radium preparation making visible certain rays emitted by radium which hitherto have been incapable of being seen. This preparation can be fixed upon gold, silver, and even upon glass, wood, and silk, which thereupon become luminous in the dark, giving out green, red, violet or yellow light of varying tints. These colors, the inventor declares, will remain luminous for 20 years.

MEASURING THE SOOT IN THE AIR

Birmingham is the "smoky city" of England, and an effort to eliminate this menace to health by the municipal authorities has led to experiments in determining the amount of smoke and dust in the atmosphere. A standard gauge has been installed having a surface area of four square feet, built on the principle of the rain gauge. Solid matter brought down by gravity or the rain passes through a duct into a glass receiver, the contents of which are removed monthly for examination and measurement.

FRICTION DRIVE USES CONE FOR SPEED VARIATION

In a friction drive for motor cars recently brought out, the friction wheel works against a cone which is so mounted that its side is parallel to the shaft on which the friction wheel is carried. The wheel slides along the shaft and its position is controlled by a system of levers similar to those usually employed in friction drives. Variations in speed are secured by sliding the wheel to engage larger or smaller sections of the cone, as desired, while the reverse is obtained by sliding the wheel to a point beyond

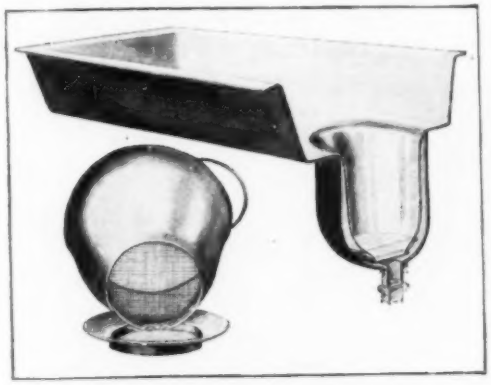


Variations in Speed Secured by Sliding Wheel to Engage Larger or Smaller Sections of Cone

the small end of the cone where it engages a smaller cone, which is geared to the shaft of the large cone and revolves in the opposite direction.

KITCHEN SINK WITH WASTE RECEPTACLE

Clogging of drain pipes in the kitchen sink may be obviated by the use of a new design, in which a large depression at one end is fitted with a waste receptacle. It is only necessary to remove this strainer to enable the collection in it to be disposed of. The strainer is so made that it can be renewed as required, when worn out.



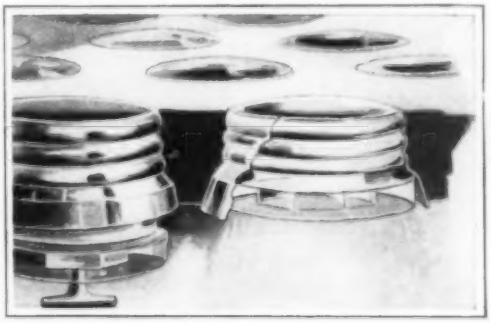
Removable Strainer Catches Grease and Dirt

FAMOUS PAINTING "MONA LISA" FOUND

Leonardo da Vinci's masterpiece, "Mona Lisa," for which a world-wide search has been made since its mysterious disappearance from the Louvre in Paris, in August, 1911, has been found in Florence, Italy, and is to be returned to the French nation. Both the theft and the recovery of the painting occurred under peculiar circumstances. The painting was stolen, according to the statement made by the Italian who took it and in whose possession it has been for the past two years, "to avenge the thefts which Napoleon I made in Italy," when priceless art treasures were carried away by the cart load. The famous painting had hung in the place of honor in the Louvre in a room which was supposed to be watched constantly, but so deftly was it taken that no clue of any kind could be found and not even the exact time of its disappearance could be determined. The thief, who knew the Louvre and the habits of the attendants well, simply watched for his chance, took the painting to a space under a stairway where he removed and left the frame, concealed the treasure under his jacket and walked out of the Louvre unsuspected. After keeping it for two years he attempted to have it placed in some museum in Florence, and this led to its recovery. This painting is one of the finest products of the Italian renaissance and is probably the most valuable work of art in the world. It is said that an offer of $5,000,000 made by the British government for it some years ago was refused by the French authorities.

A DETACHABLE SIDEWALK LIGHT

Repairing broken sidewalk lights has always been a source of annoyance and expense, for the old glass must be broken out and the old cement setting removed before the damage can be repaired. Recently an invention has been brought out intended to obviate this difficulty. A Los Angeles inventor has constructed a device consisting of a metal shell provided with threads to be set into the cement and using glasses molded with threads to fit the shell. The glasses are screwed in or out from the under side by using a socket wrench.



Removable Glass for Sidewalks

ODDS AND ENDS USED TO MAKE "FUTURIST" HOUSE

A so-called "futurist" house has recently been erected at Chester, Pa. "A modest attempt at originality in the building line," is the way it is referred to by the owner, who is confident that as good an effect "can be produced by anyone with a little taste in laying out the plan and a little boldness in putting together the material." This house is undoubtedly original in its make-up. From a distance it appears to be a substantial residence with handsome columns of stucco and flanked by walls of the same ornate material. But a nearer approach shows the columns and walls to be built up of a heterogeneous collection of odds and ends, and particularly of a miscellaneous assortment of building material that had become scattered about the owner's premises during a lifetime in the contracting business. Old sewer pipe, cobblestones, odd bricks, paving stones, old bottles, stone jars, broken crockery, several demijohns that happened to be empty, old stone doorsteps that were lying around and doing no good, and all kinds of building material, old and new, that the owner had never found a use for, were used in the construction of the walls and columns, all this material being imbedded in a solid mass of concrete. One of the oddest features of the construction is an old plow beam which occupies a conspicuous place in the wall. A curious feature about it all is that, in spite of the amazing nature of the material, the effect from a distance is exceedingly pleasing. It is said that the owner is very proud of his creation and that this feeling of pride has been greatly increased by

Picturesque Effect in Which Old Plow Beam Plays an Important Part

The Most Striking Feature of This Post is the Old Stone Jug Set into One of the Corners

Effect Obtained by the Use of Old Drain Pipes, Paving Blocks, Cobblestones and a Cement Coping

The Front Porch of the "Futurist" House in the Building of Which "Junk" from a Contractor's Yard was Used

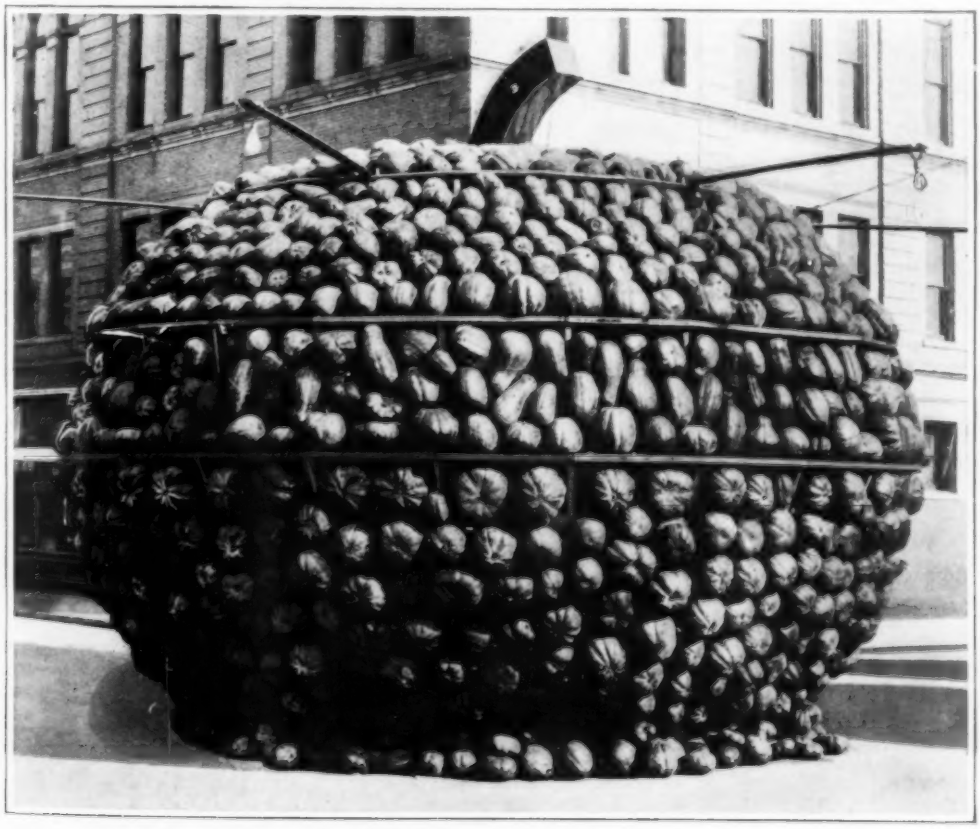
the interest of the numerous visitors attracted to the place by this odd construction. Although the material cost the owner nothing, he estimates that a duplicate would cost about $5,000.

MONSTER PUMPKIN FEATURE OF INDIANA CORN SHOW

A striking feature of the second annual corn show and industrial exhibition at Terre Haute was a mammoth pumpkin, 18 ft. tall and 22 ft. in diameter, which stood at the intersection of two busy streets. Upon a wooden framework hundreds of pumpkins were fastened by a network of wires, and formed a golden globe which well represented the agricultural wealth of the Hoosier State. The curved stem is a piece of polished wood, and at night the pumpkin was illuminated by electric lights hung from supports attached to the framework.

GROUP OF MUSEUMS FOR NEW YORK CITY

A group of 20 museums to be known as "The Museums of Peaceful Arts," and designed to become the greatest institution of the kind in the world, will be erected in New York City according to plans that are now practically completed. The cost of this magnificent group is estimated at about $30,000,000, and the annual maintenance charge, at from $2,000,000 to $3,000,000. A site sufficient to meet the needs of the entire project is to be secured at the start, but the buildings will be erected one or two at a time, as required or as funds are available. Each museum is to be devoted to a specific branch of the peaceful arts, while there will be a central library containing books and periodicals relating to subjects covered by all the museums.



A Pumpkin Monument Exhibited in Indiana

AUTOMATIC VENTILATING DEVICE

In order to economize in the use of power required for operating the ventilating system, an automatic controlling apparatus has been installed at a Michigan college, where, as in most colleges, many of the recitation rooms are in use only part of the time. With this apparatus the fans driving the fresh air into a room are stopped automatically with the ringing of the bell at the end of the recitation period, and are started again when the instructor turns on the current as the next class enters the room. Thus the maximum load the fan must carry is generally lessened and the average load considerably reduced.

BRICK-LINED STEEL CHIMNEY 400 FEET HIGH

What is said to be the tallest steel smokestack is being constructed at Jerome, Ariz., reaching upward from the top of the foundation 400 ft. 1 in. It is lined with brick to prevent the flue gases from attacking the steel, and provides the connections for three flues. The chimney is 30 ft. in diameter inside the brick lining, and 30 ft. 9½ in. inside the steel shell. The lining brick is supported on the legs of circular steel angles riveted to the inside of the shell, spaced 15 ft. apart. In this way any section of the lining can be replaced without disturbing other sections. The bell-shaped top is 50 ft. in diameter.

ARTISTIC CONCRETE PILLARS FOR BUNGALOWS

By ALBERT MARPLE

One of the latest improvements to modern bungalows in southern California is the artistic concrete pillar. Up to a comparatively recent date it seemed to be the idea that the pillar should be constructed at the front of the home simply because it was the usual thing, but a short time ago the possibility of beautifying the pillar as well as other parts of the bungalow was realized, and as a result the architects of that section have, during the past few months, been devoting much of their time to creating new designs and ideas for the beautifying of these pillars.

Possibly the latest feature is the flower-holder idea. This consists of an opening or inclosure in the sides of the pillar exposed to the street, suitable for the insertion of potted flowers or ferns of various kinds. These openings are of various sizes and designs and are constructed at from 1 to 5 ft. from the ground. This idea is being widely copied.

Another feature is the raised or indented figures on the sides of the pillars. In one instance these figures stand out from the pillar for a distance of from 1 to 2 in., while in the other they are indented into the pillars for a similar distance. These figures are made in a variety of shapes and serve to break the plain side of the pillar. They are a decided improvement.

The beam flower stand is another attractive feature. This consists of the beam which serves as the railing for the porch being run through the pillar and out the other side a distance of 6 or 8 in. Upon this little projection the flowerpot is placed. The appearance of the bungalow in general has been greatly enhanced by the beautifying of these pillars.

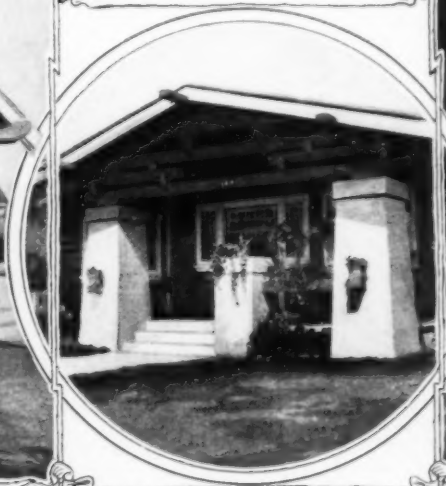
The adaptability of concrete commends it for decorative treatment and the ease with which it may be applied, even after the completion of the bungalow, makes it possible to secure extremely artistic effects. A wide range of color, through mixing varied tints with the concrete, may enhance the esthetic value of the ornamental pillars, harmonizing perfectly with natural hues of landscape, or striking contrasts accentuate the design.

Beam Projections Used as Flower Stands

Flower Holder in Side of Pillar

Pillars Ornamented with Vines and Flowers

Raised Figures Give Individuality to Pillars



Use of Half-Pillar Relieves Heavy Corner Pillars

Recessed Flower Stands in Concrete Pillar

HOW COUNTERFEITS ARE DETECTED

The hand is quicker than the eye in detecting fraudulent bank notes. The "feel" of the distinctive paper used by the government is the first warning signal that the money tendered is bad. This paper is distinctive not alone because of the introduction of silk fiber in the bill itself, but because of the treatment the stock receives in printing. The silk threads are sometimes imitated by pen and ink lines, but these do not bear close examination. The engraving has been the greatest protection, for even photo-engraving fails to bring out the proper color values, and retouching by the graving tool makes the lines heavy and irregular. Photography also fails in reproducing the color of the seal, which must be washed in with water colors, the black lines of the engraving showing through in counterfeits. The most dangerous counterfeit is that in which a genuine bill of lower denomination is bleached out and a false plate showing a high denomination placed upon it. Here is a genuine bank bill. It has the "feel." The silk threads are present. If the engraving is fairly well done and the color of approximate correctness, it becomes a dangerous counterfeit, and bankers are at once warned to be on the watch for it. In this connection the "check letter" often comes into play. All government notes are printed of one denomination, four on a sheet, and are lettered respectively, A, B, C, and D. Each note bears a treasury number. If, when that number is divided by four there remains one, the check letter should be A; if two remains, the letter should be B; if three, then C, and if there is no remainder, D. If the result shows otherwise then the numbering is wrong and the note is a counterfeit. All denominations from $1 to $1,000 have been counterfeited, as well as all our coins. The most usual method of defrauding when gold coins are handled is to saw the coins in half, extract the interior and fill with base metal.

WIRELESS FOILS VANITY OF AFRICAN NATIVES

Inhabitants of Darkest Africa who delighted in decking themselves out in bracelets of wire proved a constant menace to the proper operation of the telegraph because they simply could not let the wires alone. They repeatedly cut down the lines and carried away the wire to make ornaments of various kinds for their persons. Several large mining concerns have been obliged to install wireless telegraph communication between the railroad stations and their mines for this reason.

RAILROAD TO RUN LUNCH-COUNTER CARS

In placing a lunch-counter car in service on two of its fast trains between Philadelphia and New York, a leading eastern railroad has made an interesting innovation in passenger-train service. This car is now being run on trains that also carry standard dining cars. It is to be conducted on exactly the same lines as a lunch room in a big city, with the same quickness of service and the same informality. If the car proves as popular as anticipated, the service is to be extended to include all trains on this system where dining facilities are required.

The new car is 80 ft. long and has the same exterior appearance as an all-steel passenger coach, but the interior is radically different from that of a standard dining car. Instead of tables there is one long mahogany counter extending over half the length of the car and providing room for 21 people, and facing this counter, on one side, are revolving mahogany chairs secured to the floor. Back of the counter against the wall is a row of cupboards for supplies, while shelves for linen and silver occupy the space under the counter. The pantry and kitchen, the latter 11 ft. long, are at the end of the car. The car is lighted by electricity and is ventilated by an electrically operated exhaust fan.

Interior of Railroad Lunch-Counter Car, Where Meals are Served with Same Quickness and Informality as in an Ordinary Lunch Room

STONE QUARRY MADE INTO LANDSCAPE FEATURE

An Abandoned Stone Quarry Filled with Water to Make an Artificial Lake is the Central Feature of the Landscape Architecture That Makes This Marion, O., Residence One of the Most Attractive in America

An abandoned stone quarry, located in the middle of an otherwise desirable tract of land in the outskirts of Marion, Ohio, was made into a picturesque lake with rock-ledge shores, and now forms the central feature in an unusually beautiful garden. This garden is a good example of the modern tendency in landscape art to accept conditions as they are and either to transform undesirable features into parts of the design or, if the feature is hopeless, mask it in such a way that it does not spoil the composition. In the early days of landscape art in America, this stone quarry, which now gives point and meaning to an artistic composition, would have been filled, or the idea of using the plot for residence and garden purposes would have been abandoned entirely. It is said that the inspiration for this treatment came from the gardens of Mexico.

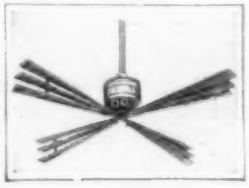
View of Residence from Northwest, Showing Mount Vernon Avenue Gateway at Left

The tract of land occupies the 266-ft. space between Bradford and Greenwood Streets and is about 700 ft. long, north and south, being bounded on the north by Mt. Vernon Avenue, an important thoroughfare running northwest and southeast. The house is located near the north end of the tract and is provided with a porte-cochère which communicates by walks and driveways with the streets on the east and west, and with an ornamental gateway opening on Mt. Vernon Avenue. Back of the house is a sunken garden and successive terraces leading down to the lake, which extends in an east-and-west direction across the tract, while beyond the lake, closing the view at the south, is a summer house flanked on each side by a pergola. The lake extends eastward into other grounds, which have also been developed into gardens, a succession of abandoned stone quarries having been made into one continuous lake suitable for pleasure boating.

View of Garden from South Veranda of Residence

MULTIBLADE FAN GIVES LARGE AIR CURRENT

The study of aeronautics has evolved a novel form of fan, having several blades superimposed and giving an increased efficiency by obviating eddy currents. It is claimed that a larger volume of air can be moved with smaller current consumption by the use of a multibladed fan than by the ordinary type, for while the total air surface of each group is larger than that of a single blade, there is less resistance and the air moves freely through the channels formed by the blades. In a series of tests recently made on a desk fan of the multiblade type, having three blades mounted one behind the other, and taking an average consumption of 25 watts at 1,400 revolutions per minute, it was found, that the pressure of air 4 ft. away was 21 per cent greater than when the ordinary fan was used; at 8 ft., the velocity was 30 per cent greater, and at 13 ft., was 37 per cent greater. Owing to the increased velocity of the air the disturbance can be felt at a greater distance and over a much larger area.



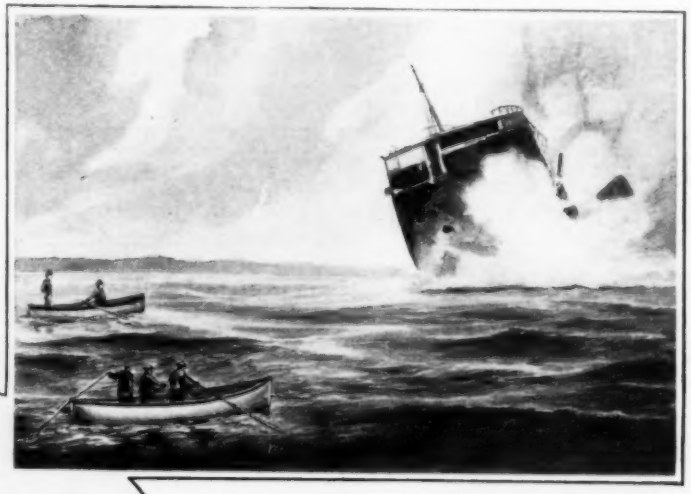
ELECTRICITY FOR COOKING FOSTERED BY CITIES

A rate of two cents per kilowatt-hour for electricity used in cooking and heating has been authorized by the municipally owned electric-light plant in Jacksonville, Fla., in an attempt to solve the problem of increasing the day load on the equipment. At this rate it is estimated that the cost of cooking one person's food with modern electric-cooking devices should not exceed 40 cents a month. In Kansas City, Kan., a rate of three cents per kilowatt-hour, which is just half the regular lighting rate, has been made for cooking and heating, and, in addition, the authorities will distribute electric cookers among the patrons of the municipal

lighting plant, to be used for a time at the city's expense. An electric-power company, using the deposits of lignite or brown coal at Bitterfeld, Germany, 83 miles south of Berlin, is producing electricity so cheaply that even the poorest families may use the current for lighting in place of kerosene. Its use for cooking and heating in Saxony is said to be assured, for no kind of fuel will be able to compete with electricity at the low rate offered by the company.

DESTROYING WRECK WHICH MENACED COMMERCE

When the steamer "Ulstermore" ran aground in Crosby Channel, an estuary of the Mersey River, last winter, she was buffeted against a rocky ledge and broke in two. A portion of the damaged steamer remained above the water and became a danger to traffic, and it was decided to remove the wreck with dynamite. The steamer was of 6,400 tons burden, and to clear away the wreck, a large charge and careful placing was necessary. The explosion under the remains of the vessel was sufficient, however, to remove the derelict and completely clear the channel.



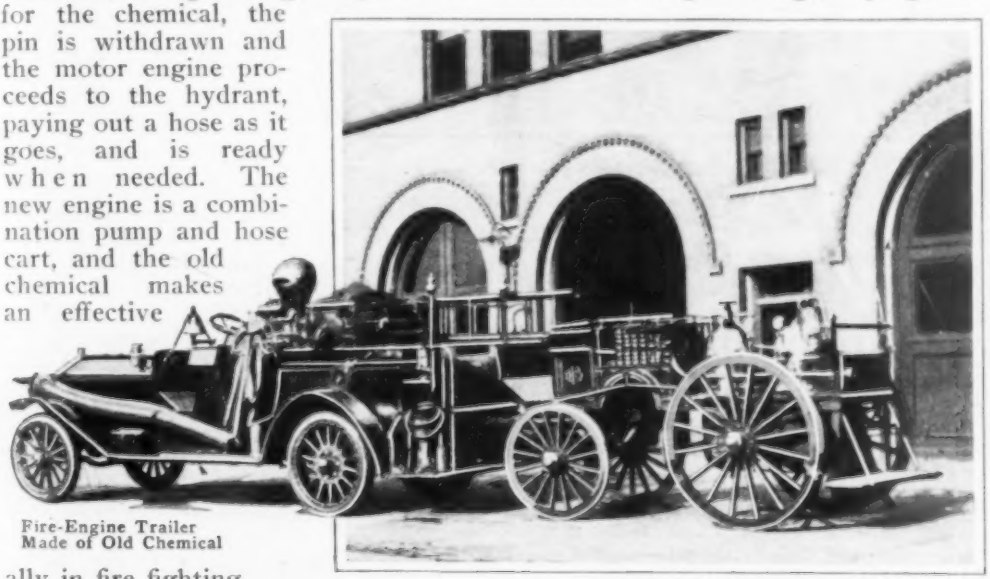
Wreck of the "Ulstermore" Removed from Channel by Dynamite

LARGE COAL DEPOSITS FOUND IN SPITZBERGEN

Spitzbergen, an island in the Arctic Ocean, gives promise of becoming an important coal-producing center as the result of mining operations carried on by an American company which shipped about 35,000 tons of coal to American ports during the year 1913. The limited operations already carried out by this company indicate deposits aggregating over 60,000,000 tons. The mines now being worked give employment to 250 or 300 men, and, although the shipping season only lasts about three months, the mines are operated continuously throughout the year. The beds are unusually uniform, being about 3½ ft. thick. The mining problem is therefore simple, but the question of ownership of the coal fields is one that is expected to lead to complications, as the sovereignty of this island has never been definitely determined. Title to the coal fields was acquired by the American company from a Norwegian company that claimed title by right of exploration.

HOMEMADE TRAILER FOR MOTOR FIRE ENGINE

The fire department of Evanston, Ill., has demonstrated that old horse-drawn chemical engines need not be relegated to the scrap heap with the introduction of modern motor-driven equipment. Cutting off the wagon tongue of the old engine they converted it into a trailer which they attach to the motor-driven engine, and find it a very effective combination. In many cases the chemical equipment is all that is needed to put out the fire, but if the blaze shows signs of getting too hot for the chemical, the pin is withdrawn and the motor engine proceeds to the hydrant, paying out a hose as it goes, and is ready when needed. The new engine is a combination pump and hose cart, and the old chemical makes an effective



Fire-Engine Trailer Made of Old Chemical

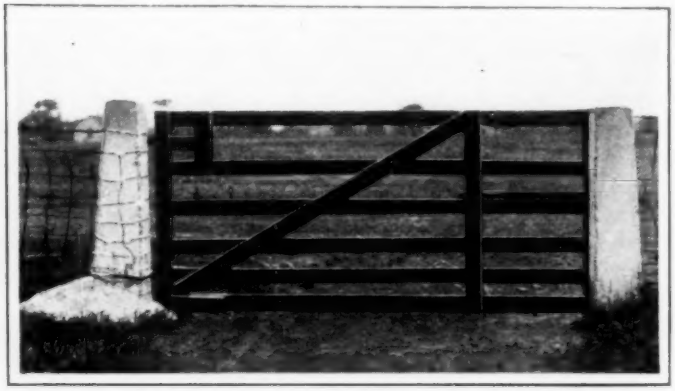
ally in fire fighting.

AMEER OF AFGHANISTAN HAS FIFTY-EIGHT MOTORS

His Majesty, Habibullah Khan, Ameer of Afghanistan, whose official title proclaims him "Light of the Nation and of the Faith," rules over a hermit kingdom twice as populous as Thibet, though scarcely a quarter as large. It is a forbidden land, foreigners being rigidly excluded, or admitted only under almost impossible conditions, and out of a population of over 5,000,000 only six Europeans and two Americans are to be found resident. The Ameer is a progressive potentate, however, and his palace at Kabul shows the influence of western civilization. In the royal garage are 58 automobiles of various makes, but the Ameer is not restricted in his choice of transportation mediums, as 50 elephants are kept in the royal herd and four gorgeous state carriages presented by Queen Victoria are sometimes used. It is as virtual purchasing agent for the kingdom that the Ameer is unique among sovereigns. While there is but one newspaper published in Afghanistan, the court journal, he is an assiduous reader of foreign catalogs, buying freely anything that strikes his fancy, for the use of the members of his household or for the army. He is guided largely by the illustrations in making his choice, and when he decides he wants anything, he is insistent that delivery be made in the shortest possible time. As royal orders are invariably cash in advance, through a custom established and enforced by thrifty foreign houses, shippers hasten to oblige. Photography is one of his favorite pursuits, and he is an adept at enlargements. Golf, polo, and cricket are popular among the court set, who have adopted European dress except that the turban is universally worn.

CONCRETE GATEPOSTS FOR FARM FENCES

A pair of concrete gateposts of the type that is used for all the main gates on an 880-acre farm near Hughesville, Mo., is shown in the accompanying photograph. The additional amount of concrete at the base of the hinge post makes the post steady and keeps the gate from sagging. The latch post, which is not subjected to any strain, does not need the extra concrete base to brace it.



These Concrete Gateposts Keep the Gate from Sagging

PLOW AND SILO TO REDEEM FARMS IN INDIA

An American plow driven by a missionary near Allahabad, India, is revolutionizing methods of the farming community thereabouts. It had been the custom for centuries to root out the stubble of previous harvests before plowing the soil for the new crop. This impoverished the soil and added greatly to the labor. An American missionary showed the value of the stubble by plowing it under, an operation easy to accomplish with the heavy American plow. At first he used four draft cattle to pull it, but after building a silo pit he was able to fatten and strengthen his cattle so that only two are required now. These and other experiments are being followed by neighboring farmers with satisfactory results.

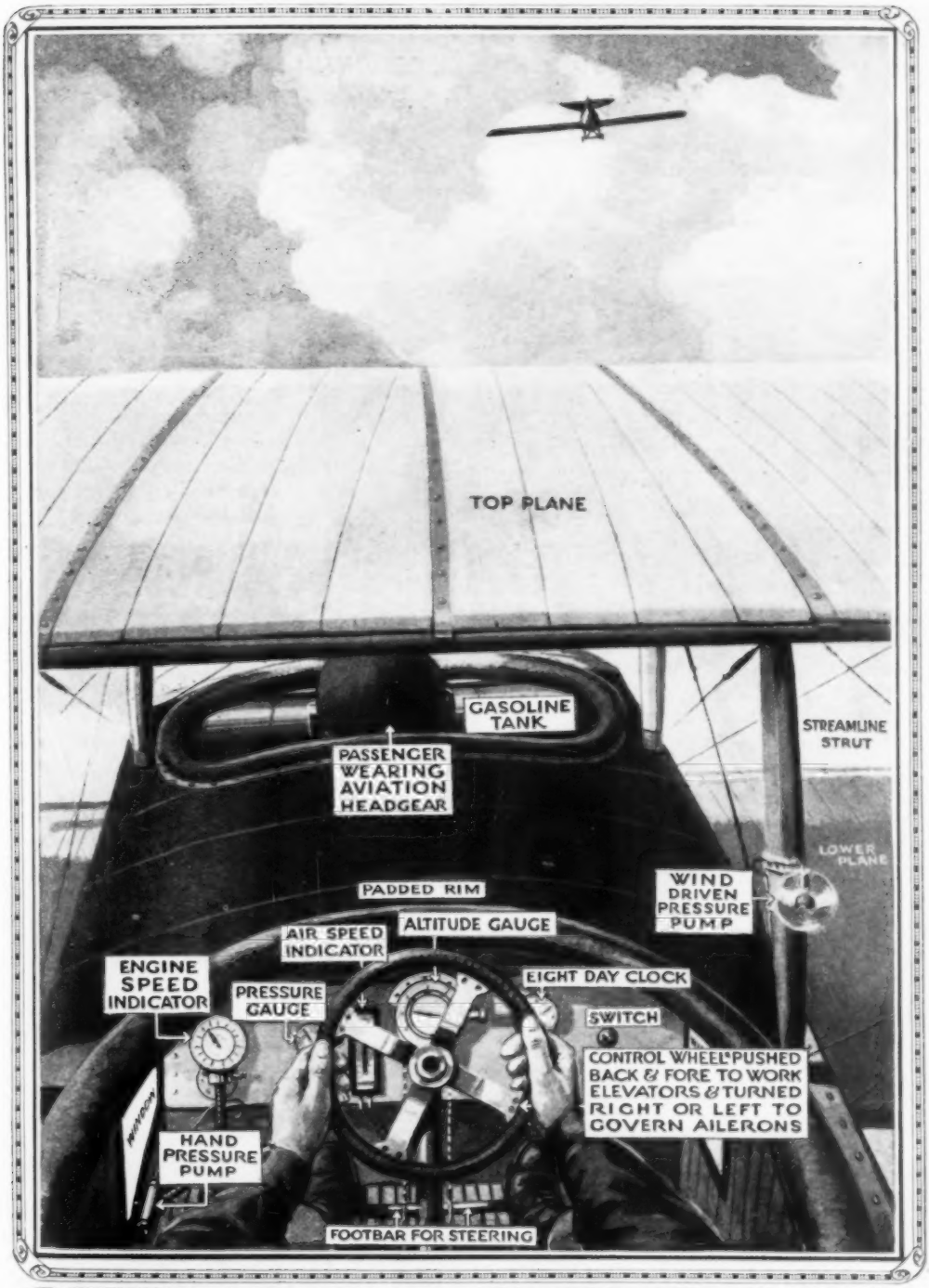
THE PERMANENT BUILDINGS AT PANAMA

To conform with the tropical climate and topography of Panama, the permanent canal buildings have been designed in Italian style, with arcades or exterior colonnades and arched windows. They are to be built of reinforced concrete or hollow concrete blocks, with stucco on the outside and red tile roofs. Fourteen different architectural projects, including the new administration building, the permanent quarters for the white members of the operating staff, the Balboa terminal office buildings, the projection of town sites, and the hydroelectric station and three lock-control houses at Gatun, are now in the draftsmen's hands. The new town buildings for Balboa, which are being designed, comprise a post-office, police station, fire station, dispensary, telephone building, clubhouse, hotel, social hall, church, commissary store, and schoolhouse. Landscape architects are working on parks, streets, and town sites.

BRICK MADE OF PEAT USED AS WOOD SUBSTITUTE

In Sweden small buildings are being erected of brick made of peat. The brick are either plastered in between cement supports, or are laid in plaster as ordinary building brick made of clay. These peat bricks are being used as a substitute for wood in the construction of buildings of no great size. The process of manufacturing the peat bricks has been patented.

¶About 56,000,000,000 cu. ft. of gas was produced in Ohio in 1912. Practically all of this, with 65,000,000,000 cu. ft. piped in from West Virginia, was used in the state.



This Shows How an Airman Steers a Biplane. The Pilot is Holding the Wheel, the Passenger Seated in Front. The Wheel is Mounted on a Jointed Pillar. Turning It to Right or Left Controls the Ailerons, by Which the Craft is Balanced. By Pulling the Wheel Toward Him or Pushing It Away, the Pilot Governs the Elevating Planes, Which Control the Rise or Descent. The Footbar Controls the Vertical Rudder, for Turning to Right or Left. Various Instruments Indicate Engine Speed, Altitude, Direction and Pressure in the Tanks, as Well as the Time of Day

Courtesy of The Sphere

LOUD-SPEAKING TELEPHONE FOR AIRMEN

The difficulty of hearing ordinary conversation above the roar of the motor and the whir of the propeller

Device Makes Conversation Easy Aloft

makes communication between the airman and his passenger or mechanician extremely arduous if not impossible, and a remedy is sought in a telephone with microphone attachment. The speaking device is placed directly against the mouth, and is supported by a curved metal shaft which is of one piece with the receiver, and is held in place by attachment to the helmet. Thus equipped, conversation is easy, and undivided attention may be given to handling the machine. A storage battery furnishes the electric current.

SHAVING MIRROR WITH ELECTRIC LIGHT

A French novelty of interest to men who shave themselves is shown in the illustration herewith. It is an adjustable mirror, at the lower edge of which an electric light is inset. The lamp is so placed that it does not throw a glare into the eyes, but illuminates the face perfectly. The device may also be used to light up the interior of the mouth and upper throat. It may be placed on any convenient surface or suspended from a hook on the wall.

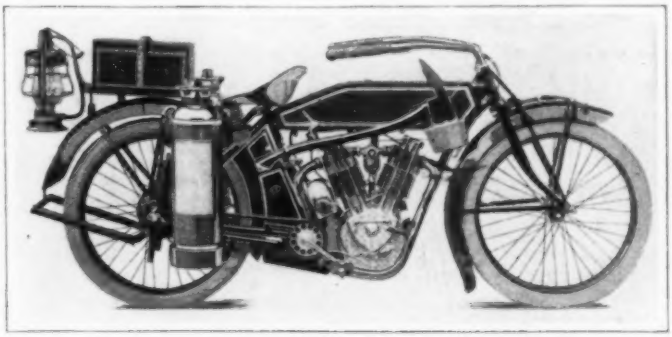
OIL WELLS CLOGGED BY PARAFFIN DEPOSITS

After the initial spurt of an oil well, which is due to the sudden relief of pressure under which the gas and oil are confined and which often lasts for a considerable time, an ordinary well settles down to a period of fairly regular production, and this period is followed eventually by a steady decline. That this decline is caused in many wells not by the exhaustion of the supply, but by the clogging up of the pores of the sand so that the passage of the oil into the well is obstructed, is the explanation recently advanced by the Bureau of Mines. In some oil fields the petroleum consists of hydrocarbons which range from the heaviest oils to the lightest gas, the gas being held in the liquid in much the same manner that the gas is held in a bottle of soda water. The expansion and volatilization of these gases as the petroleum flows into the well has a refrigerating effect exactly like that of the expansion of ammonia in a refrigerating machine. Although this refrigerating process is slow, it is sufficient to chill the liquid petroleum and to cause the heaviest paraffin to be deposited as a sediment, and this results gradually in clogging the sand in the vicinity of the well.

Mirror Lights the Face While Shaving

RURAL FIRE DEPARTMENTS USE MOTORCYCLES

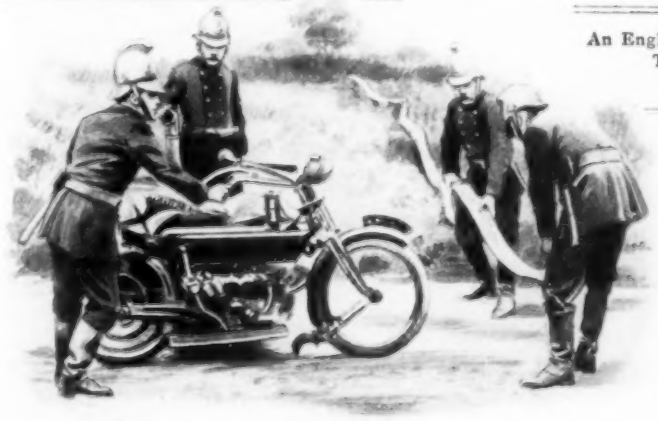
To reach a fire before it has had time to get a good start is the ideal of all fire departments, and in rural communities especially the need of getting to the blaze while it is still incipient is great. The motorcycle offers to the rural fire fighters quick service over any roads, even where only winding paths through woods or across fields lead to the burning building. At the Chicago Motorcycle Show a fully equipped machine was exhibited carrying two chemical fire extinguishers, a fireman's ax, a small reel of hose and a lantern.



An American Motorcycle Equipped for Fire Service

Used in the Fire Department of Sandwich, England

An English Rural Fire Brigade of Four That Travels in a Sidecar



Courtesy The Car

In one English rural fire department, four firemen hurry to the blaze in a single sidecar with hose and necessary equipment. Many rural communities are equipping themselves with these speedy vehicles which

promise that "stitch in time" so much sought after in combating serious conflagrations. The fire brigade at Sandwich is another English department using a motorcycle with a sidecar. Two members with hose and extra nozzles riding this machine invariably reach the fire ahead of the department, and are often able to hold the blaze in check until the arrival of the apparatus, if they do not succeed in wholly extinguishing the flames themselves, as frequently happens when the alarm has been sent in promptly.

POISONOUS GASES USED TO DISLODGE DESPERADO

In an attempt to stifle or drive into the open a Mexican desperado who had taken refuge in a mine at Bingham, Utah, all openings to the mine were closed and poisonous gases were circulated through the workings by the ventilating system. Wet gunpowder was burned to generate what is known to miners as "black damp," and, in addition, large quantities of sulphur, tar, and oil were used.

Scene at the Entrance to a Utah Mine in Effort to Smoke Out a Mexican Desperado

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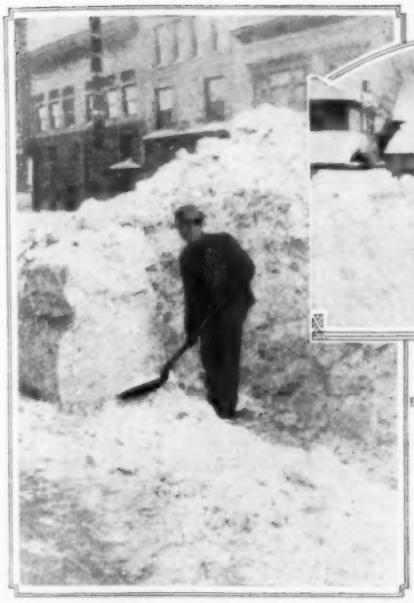
DENVER SAVES SNOW FOR SUMMER FETE

Denver was visited by a record-breaking snow storm during the first week in December, 1913, when 42 in. of wet snow fell, blockading street-car lines and railroads. Drifts of 7 ft. were not uncommon, and the task of clearing the streets was a formidable one. Instead of throwing the snow taken from the street into the Platte River, the usual custom, it was decided to deposit it all in one big pile on the Civic Center site, six square blocks of ground lying at the foot of the State Capitol, which had been recently purchased and cleared for a proposed beauty spot. It is proposed to cover the pile with a thick layer of sawdust and house it with lumber taken from the old grandstand erected for the Knights Templar Conclave last year and uncover it next summer during the Festival of Mountain and Plain, for a few days of tobogganing, skiing and general snowballing.



Clearing Off Sidewalks in Business District

Everybody's Back Yard was Full to the Fenceline

Snow Canyon in Denver Street

Denver's Great Snowstorm Buried the City under a Four-Foot Blanket; Snow Piled 50 Ft. High in Front of the State Capitol

Snowed In at the Curb

Bungalow Almost Snowbound

AVIATION'S DEATH TOLL IN 1913 THE HEAVIEST YET

As was to be expected, the year 1913 showed a considerable increase in the number of deaths due to aeroplane accidents. Many more airmen than ever before made flights during the year; many thousands more miles were covered. As against 140 aviation fatalities in 1912, there were 192 in 1913. In all the years before 1912, since the Wrights made the first public flights in a heavier-than-air machine, there had been but 114 deaths—1 in 1908, 4 in 1909, 32 in 1910, and 77 in 1911.

Twenty-six of the deaths of 1913 occurred in the United States, 18 in Great Britain, 61 in Germany, 51 in France, and 36 in various other countries. Twelve airmen fell into the water and were drowned, 157 were killed by the impact of falling to earth, 9 were burned to death and 14 met death in various other ways, 9 of these being spectators who were killed while watching the airmen. One hundred and forty-six of those killed were piloting their machines at the time, 15 were mechanicians and 22 were passengers.

September produced the longest list of casualties, 23 fatal accidents occurring in that month. There were 22 in April and an equal number in July, while December was the safest month, with but 6 deaths.

Undoubtedly the best-known airman who was killed in 1913 was Col. S. F. Cody, an American naturalized in England, who had done perhaps more than any other one man to further the interests of aviation in Great Britain and had won international fame through his inventions. He was killed on Aug. 7 by the failure of a biplane of his own construction. A passenger with him was also killed. Almost equally famous in Europe was M. Vlaicu, a Roumanian pioneer in aviation, who was killed on Sept. 13 at Bucharest. Charles Nieuport, a French airman, famous the world around as a designer and builder of monoplanes, was killed on Jan. 24.

Besides the 192 fatalities due to aeroplane accidents, 50 persons lost their lives in 1913 through accidents to airships or dirigible balloons. Twenty-eight were killed on October 17, when the Zeppelin "L 2" exploded over Johannisthal; 15 died when the "L 1" was wrecked in the North Sea, Sept. 9; 5 French aeronauts were killed by the wrecking of a balloon on April 17, and 2 German soldiers were dropped from a Zeppelin that broke away from its moorings on Sept. 10.

The following tabular list of aviation deaths includes 12 which occurred in 1912 after the list published in the January, 1913, issue of Popular Mechanics Magazine was compiled, and the complete record for 1913.

AVIATION DEATHS, NOV. 21 TO DEC. 31, 1912

NAME	PLACE	DATE	MACHINE
Quartermaster Jean Laurent	Etampes, France	Nov. 21	
Lieut. von Winterfeld	Johannisthal, Germany	Nov. 22	
Paul Arondel	Juvisy, France	Nov. 30	Monoplane
M. Imbach	Villacoublay, France	Dec. 3	Monoplane
Dr. Jules Constantin	Tchatalja, Turkey	Dec. 8	Biplane
Lieut. Wilfred Parke, R. N. Arkell Hardwick, passenger	Wembley, Eng.	Dec. 15	Monoplane
Horace Kearney Chester Lawrence, passenger	Pacific Ocean in flight from Los Angeles to San Francisco	Dec. 15 or 16	Flying Boat
Lieut. Drausfeld	Mainz, Germany	Dec. 21	
Edward Petre	Marske, Yorkshire, Eng.	Dec. 24	Monoplane
Fung Yue	Peking, China	Dec. 29	

AVIATION DEATHS, 1913

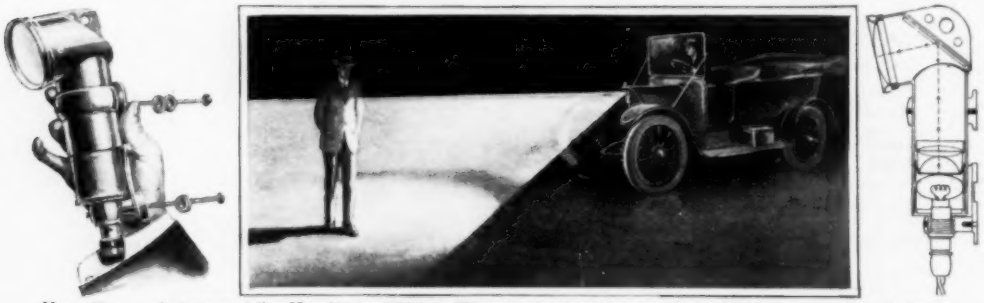
NAME	PLACE	DATE	MACHINE
Lieut. Bérode	Sainte Anne, France	Fell Dec. 31, 1912; Died Jan. 1, 1913	
Mallet, mechanician	Drowned in English Channel near Fécamp, France	Jan. 3	Flying Boat
L. F. MacDonald; Mechanic Harry England	Drowned in the Thames near Dartford, Eng.	Jan. 13	Monoplane
Russian officer	Austrian Frontier	Jan. 18	
Lieut. Origone	Near Buenos Aires, Argentina	Jan. 19	
Lieut. von Scheele; Lieut. Schlegel, passenger	Magdeburg, Germany	Jan. 23	Biplane
Frank Boland	Port of Spain, Trinidad	Jan. 23	Biplane
Lieut. Robert Waltz	Halberstadt, Germany	Jan. 23	
Charles Nieuport; René Guyot, mechanician	Etampes, France	Jan. 24	Monoplane
Eusebione	Villa Lugano, Argentina	Jan. 27	
Lucien Hild	Aix-la-Chapelle, Germany	Jan. 28	Monoplane
Joseph Notari	Turin, Italy	Feb. 3	
Lieut. Jenetzky; Mate Dieckmann	Gulf of Danzig, Prussia	Feb. 7	Flying Boat
——— Lenk	Leipzig, Germany	Feb. 15	Biplane
Lieut. Mittner	Vienna, Austria	Feb. 17	
——— Priczinski	Tegel, Prussia	Feb. 17	
Bruno Werntgen,	Hangelar, Prussia	Feb. 25	
Helfersreider, non-com. officer	Mühlhausen, Prussia	Feb. 26	
G. W. England	Salisbury Plain, Eng.	Mar. 5	Monoplane
Eugène Mercier	Ambérieu, France	Mar. 16	Monoplane
Capt. Moreno	Somma Lombarda, Italy	Mar. 19	
Pietro Primavesi	Lake Lugano, Italy	Mar. 19	Drowned
Lieut. Porteau	Avord, France	Mar. 23	
Lieut. Brossard	Verdun, France	Mar. 28	
Lieut. Tokuda; Lieut. Kimura	Tokyo, Japan	Mar. 28	Monoplane
Lieut. Pietrowsky	Warsaw, Russia	Mar. 28	
Sergeant Petrovitch	Near Scutari, Albania	Apr. 1	Biplane
Adjutant Yves Faure	Buc, France	Apr. 2	Biplane
Quartermaster Chauroux	Amiens, France	Apr. 2	Monoplane
Lieut. Alex Cerlovsky (suicide)	——— Russia	Apr. 3	
Lieut. Rex Chandler, passenger	San Diego, Cal.	Apr. 8	Flying Boat
——— Reimer	Gelsenkirchen, Germany	Apr. 10	Biplane
Lieut. Lichte	Gelsenkirchen, Germany	Apr. 10	
Perez Arzemo	Buenos Aires, Argentina	Apr. 11	
Geo. Verminck	Saigon, Indo-China	Apr. 13	
Luiz Acevedo	Santiago, Chile	Apr. 14	
Louis Gaudart	Monaco	Apr. 15	Flying Boat Drowned
Lieut. Argyropoulos; Constantinos Manos, passenger	Salonica, Greece	Apr. 17	Monoplane
Otto W. Brodie	Clearing, Chicago	Apr. 19	Biplane
François Gallot, passenger	Turin, Italy	Apr. 20	
Lieut. Réné de Blaumont	Villacoublay, France	Apr. 21	Monoplane
Paymaster E. R. Berne	Eastchurch, Eng.	Apr. 21	
Lieut. Ehlers	Doeberitz, Germany	Apr. 22	Monoplane
Elia Dunetz	Johannisthal, Germany	Apr. 24	
Vsevolod Abramovitch	Johannisthal, Germany	Apr. 25 (Fell Apr. 24)	Biplane
Lieut. Roger Harrison	Farnborough, Eng.	Apr. 28	Biplane
Lieut. von Germersheim	Munich, Bavaria	Apr. 28 (Fell Apr. 23)	
Lieut. von Mirbach; Lieut. von Brunn	Darmstadt, Germany	Apr. 30	Biplane
Herman Jansen (killed while helping start machine)	Oakland, Cal.	May 2	Flying Boat
Sergt. André Battini	Saint Cyr, France	May 3	
M. Rech	Zurich, Switzerland	May 4	
Charles Carlson	Akron, Ohio	May 5	
Koha Takeishi	Osaka, Japan	May 7	
Lieut. J. D. Park	Olive, near Santa Ana, Cal.	May 9	Biplane
Capt. Jucker; Dietrich, passenger, died May 25	Johannisthal, Germany	May 14	Biplane in collision with Monoplane
Capt. Deodatus Andrich	Capljina, Austria	May 17	
Russian Airman	Near St. Petersburg	May 18	Collision of Aeroplanes
Lieut. D. L. Arthur	Montrose, England	May 27	
—— Michaelis	Johannisthal, Germany	May 27 (died of heart failure June 1, due to accident)	

NAME	PLACE	DATE	MACHINE
A. Horn	Hanover, Germany	May 28	Monoplane
Lieut. Jean F. Kreyder	Bourges, France	May 30	Monoplane
Lieut. Balabouchkine	Peterhof, Russia	May 31	
James Colovan	Cicero, Ill.	May 31	Biplane
August Bernard, Rose Amicel	Buc, France	June 5	Biplane
M. Seidi	Aspern, Austria	June 11	
Andrew Drew	Lima, Ohio	June 12	Biplane
Earl Sandt	Grove City, Pa.	June 12 (died June 21)	
M. Manio	Lisbon, Portugal	June 13	Monoplane
Lieut. James R. B. Kennedy, passenger	Brooklands, Eng.	June 13	Monoplane
M. Debever	Etampes, France	June 18	Biplane
Lieut. Kraftl, —— Gerbitz, mechanician	Johannisthal, Germany	June 19	Biplane
Ensign Wm. D. Billingsley	Chesapeake Bay	June 20	Flying Boat
Lieut. Nepallek, passenger	Aspern, Austria	June 23 (died June 25)	
Fred F. Gardiner	Lake Keuka, N. Y.	June 23	Biplane; Drowned
Maurice L. Foulquier	Chalons-sur-Marne, France	June 26	Monoplane
Robert Wight	Brighton, Eng.	June 29	Burned to death
M. Parisot, Two spectators also killed	Liège, France	June 29	
Capt. Rey, Bouchardier, mechanician	Montgenost, France	July 2	Biplane
R. Hoelscher, passenger	Johannisthal, Germany	July 4	Collision of two Biplanes
Grover Bell	Petaluma, Cal.	July 4	Biplane
Harvey Crawford	Prosser, Wash.	July 5	
Lieut. Boeder	Kunersdorf, Germany	July 6	
Lieut. Loren H. Call	Near Texas City, Texas	July 8	Biplane
—— Lendner, Albert Sénard	Würzburg, Bavaria	July 9	Monoplane
—— Bertin, father and son	Guyancourt, near Versailles, France	July 14	Monoplane Burned to death
—— Dietrichs	Habsheim, Germany	July 14	
Robert Fabbri	Milan, Italy	July 15	Monoplane
Siegfried Stoll	Jüterbog, Germany	July 15 (died July 16)	Monoplane
Thaddeus Kerns	Chico, Cal.	July 15	Biplane
Maj. A. W. Hewetson	Larkhill, England	July 17	Monoplane Possibly burned to death
Little girl, killed by propeller	Neuendorf, Germany	July 17	
Sergt. Westphely	Frankfort-on-the-Main, Germany	July 18	Biplane
Lieut. Chaignot	Mourmelon, France	July 18	
Malarte Sapper	Châlons, France	July 21	Biplane
—— Wheelmer	Johannisthal, Germany	July 22	Monoplane
Stengler, passenger	Frankfort-on-the-Main, Germany	July 24	Biplane
—— Chambenois	Auterive, France	July 27	Flying Boat; Not drowned
—— Paillard	Freiburg, Germany	July 27	
Lieut. Mathay	Gatchina, Russia	About July 30	
—— Broks	Johannisthal, Germany	Aug. 4 (fell Aug. 8)	Died from burns received in tank explosion
Lieut. Polikarpoff and mechanician	Krasnoe-Selo, Russia	Aug. 5	Monoplane
John Bryant	Victoria, B. C.	Aug. 6	
S. F. Cody, W. H. B. Evans	Aldershot, England	Aug. 7	Flying Boat
Fritz Roessler, Stephan, pupil	Brueck, Germany	Aug. 10	Monoplane
Henri de la Roche	Omaha, Nebr.	Aug. 15 (fell week before)	
Aug. Ruetgers, passenger	Leipzig, Germany	Aug. 15	Biplane
Milton Korn	Celina, Ohio	Aug. 19 (fell Aug. 13)	
Lieut. Schmidt	Halberstadt, Germany	Aug. 22	Monoplane
M. de Montalent, Métivier, mechanician	Rouen, France	Aug. 24	Flying Boat
Lieut. Sansever, Lucien Laforgues, sapper	Villacoublay, France	Aug. 25	Monoplane

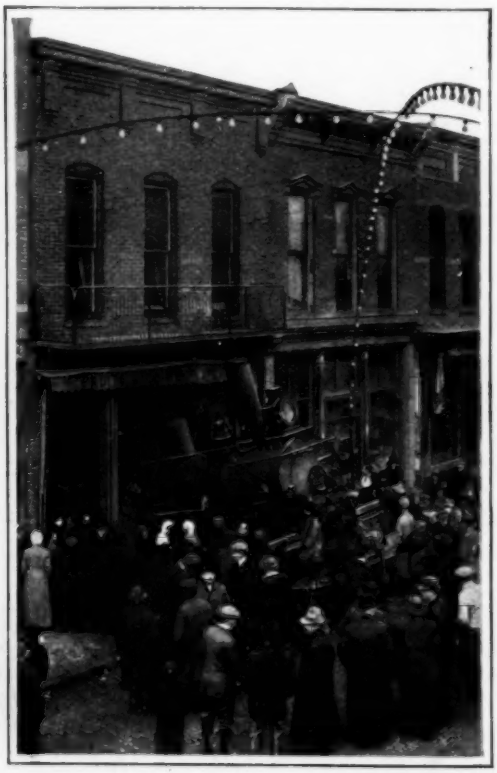
NAME	PLACE	DATE	MACHINE
Mme. Richer	La Roche-Bernard, France	Sept. 1 (died Sept. 2)	
M. Desvaux de Lyf, passenger	Melun, France	Sept. 2	Biplane
Lieut. Paul Lefranc Mme. Lefevre	Rheims, France	Sept. 2	Biplane
George Schmidt	Rutland, Vt.	Sept. 2	
Lieut. Humphries	Salisbury Plain, Eng.	Sept. 3	Burned to Death
Non-Com. Officer Kahle	Mülhausen, Germany	Sept. 4	
Lieut. Moss L. Love	San Diego, Cal.	Sept. 4	Biplane
Lieut. von Eckenbrecher Lieut. Prinz	Brieg, Germany	Sept. 4	Monoplane
Perry C. Davis	Mauston, Wis.	Sept. 5 (fell) Sept. 16 (died)	Biplane
Paul Senge	Cologne, Germany	Sept. 8	Monoplane
Doctor Ringer	Berlin, Germany (Accident due to physical weakness of pilot)	Sept. 9	Monoplane
M. Chomienne	Lyon, France	Sept. 9	Monoplane
M. Druschinin	Sebastopol, Russia	Sept. 9	Monoplane
Four Spectators	Berncastel, Germany	Sept. 11	Biplane fell among crowd
Hans Lorenz	Bork, Germany	Sept. 12	Monoplane
M. Avinas	Gatchina, Russia	Sept. 12	
M. Aurelius Vlaicu	Banesti, Roumania	Sept. 13	
Max Lillie	Galesburg, Ill.	Sept. 15	Biplane
Lieut. Fischer	Sebastopol, Russia	Sept. 19	Monoplane
Lieut. Schulz	Johannisthal, Germany	Sept. 21	
Lieut. Cazes	Mogador, Morocco	Sept. 22	Monoplane Drowned
Lieut. Souleillan (suicide)	Oudjda, Morocco	Sept. 24	Monoplane
Capt. Bertram Dickson	Milan, Italy, 1910	Sept. 28 (died)	Collision of Biplanes. Death due to injuries received three years earlier at Milan
Ulrich Birch	Copenhagen, Denmark (first in Scandinavia)	Oct. 2 (died Oct. 9)	Biplane
Maj. G. C. Merrick	Upavon, England	Oct. 3	Biplane
Quartermaster Hurtard	Rheims, France	Oct. 4	Monoplane
Sapper Laverlochère	Chaumont, France	Oct. 4	Monoplane
Geo. Sivel	Marmande, France	Oct. 5	Monoplane
Miss Ruth Hildreth	Fell from roof struck by Beachey's aeroplane, Hammondsport, N. Y.	Oct. 7	Biplane
Lieut. Negel	Bukharest, Roumania	Oct. 11	Biplane
E. W. Cheeseman	Kimberley, So. Africa	Oct. 12	
Albert J. Jewell	Hempstead, L. I.	Oct. 13	Monoplane Lost in the sea
Lieut. Koenig	Neuendorf, near Berlin, Germany	Oct. 13	
Capt. Haeseler	Near Breslau, Germany	Oct. 17	Burned to death
Lieut. Koch Sergt. Mante	Near Würzburg, Bavaria	Oct. 17	Biplane
Lieut. Klevchintski with mechanician	Near Moscow, Russia	Oct. 18	
Lieut. Garnier Sapper Gendreau	Epinal, France	Oct. 20	Biplane
Corporal d'Autroche	Epinal, France	Oct. 20	Biplane
Quartermaster Canal	Rheims, France	Oct. 28	Monoplane
Capt. Denis de Lagarde	Villacoublay, France	Nov. 12	Monoplane
Lieut. C. Perry Rich	Manila, P. I.	Nov. 14	Flying Boat drowned
M. Corbon	Chantilly, France	Nov. 24	Monoplane
—— Serbinow	Augustovo, Russia	Nov. 24	
Lieut. Hugh M. Kelly Lieut. Eric L. Ellington	San Diego, Cal.	Nov. 24	Biplane
Edmond Perreyon	Buc, France	Nov. 26	Monoplane
Lieut. Louis Briault Mechanician Brouillard	Epernay, France	Nov. 26	Biplane Burned to death
Capt. G. V. Wildman-Lushington	Eastchurch, England	Dec. 2	
Capt. A. V. Philip Giorgi	Malpensa, Italy	Dec. 4 (Fell Nov. 24)	Monoplane
Lieut. Wachsmuth	Libau, Russia	Dec. 6	Flying Boat Drowned
—— Schutzenheister	Leipzig, Germany	Dec. 8	
Leon Letort	Barbezieux, France	Dec. 10	Biplane
Remus	Johannisthal, Germany	Dec. 29	

GLARELESS LAMP FOR AUTOMOBILES

A new motor headlight which brightly illuminates the roadway without throwing a blinding glare into the eyes of the driver of an approaching car is shown in the pictures herewith. It is an electric light, using a mushroom-shaped tungsten bulb, the beams from which pass through two condensing lenses and are then reflected by a mirror through a projection lens to the roadway. Externally, the new headlight is tubular in form, the electric bulb being at the base, and the light is projected upward through the lenses to the mirror where it is deflected, never striking higher than 4½ ft. above the surface of the road. The lamp is attached to the radiator by small bolts, and is hermetically sealed.



New Type of Automobile Headlight Which Throws Light Beams Forward and Downward Only



Grand Opening in Grocery Store by Wandering Locomotive

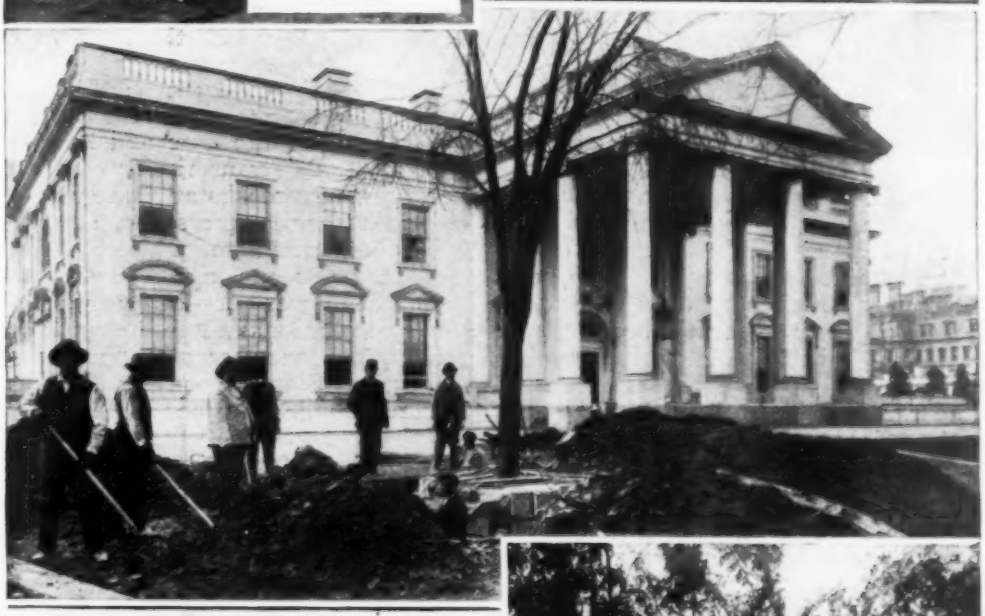
RUNAWAY ENGINE GOES TO MARKET

An engine which was standing on a coal track in Huntington, Ind., began to back when leaky valves allowed steam to creep into the cylinders, and before it could be caught, had run off the end of the spur, across a brick pavement, and into a grocery. Fortunately the accident occurred at midnight, and no one was injured. Owing to the prompt action of the fire department, which extinguished the fire in the boiler, no blaze resulted. The engine was hauled out by the wrecking crew next morning, none the worse for its midnight jaunt.

PRESIDENT PLANTS ELM IN WHITE HOUSE GROUNDS

The "Wilson Elm" now occupies a conspicuous position in the White House grounds in Washington, and has as its associates, trees of various kinds planted by nearly every other president of the United States. The latest acquisition of the Executive Mansion's horticultural collection was

President Woodrow Wilson Throwing First Shovelful of Dirt

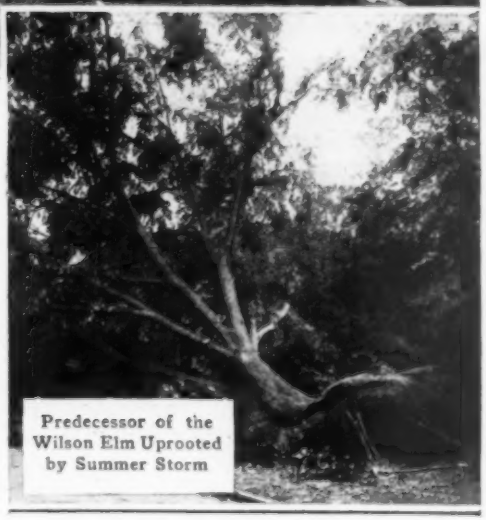


Preparing the Wilson Elm for Ceremony of Planting

planted by President Wilson about the middle of December, with informal ceremonies, while about a hundred persons looked on. The "Wilson Elm" is 25 years old, having stood for that length of time in the government's horticultural grounds. It was mounted on trucks, after the roots were crated and wrapped with burlap. It towers 40 ft. in the air.

The new elm takes the place of the Hayes elm which was uprooted last July. It was regarded by experts as one of the handsomest specimens of elms in the country. It stood on the front lawn opposite the east end of the main portico of the White House. It cast a shadow several hundred feet in circumference, and its trunk measured about 8 ft. in circumference. During the storm it was uprooted bodily and thrown across the main driveway. The hole in the ground where the roots had been was 15 ft. deep and about 25 ft. in diameter.

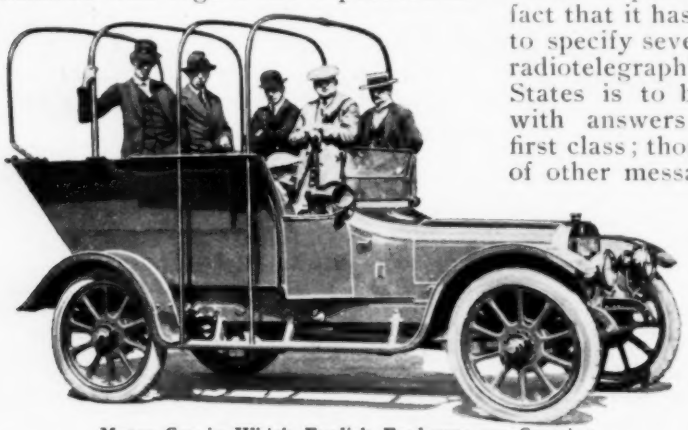
Since the destruction of the old tree, President Wilson several times expressed his regret at its loss. When asked to participate in the planting of its successor, he readily agreed.



Predecessor of the Wilson Elm Uprooted by Summer Storm

PONTOON MOTOR CAR TO CROSS AFRICA

From Cape to Cairo by motor car is a trip now being taken by six Englishmen who regard the expedition as



Motor Car in Which English Explorers are Crossing the African Continent

feasible. They have a remarkable car, which is specially constructed, so that one-half is carried within the other when fitted on the chassis. Both portions may be taken off the chassis and bolted together to form a boat-shaped pontoon capable of carrying the chassis and luggage across streams. The car is built to stand hard usage, and uprights carry awnings for protection against the sun. By never getting more than 200 miles from a railroad they plan to be within reach of a supply of gasoline at all times.

NEW CLASSIFICATION OF WIRELESS MESSAGES

The growth of the wireless message as a commercial medium of communication is perhaps best shown by the fact that it has been deemed necessary to specify seven divisions into which radiotelegraphic service in the United States is to be classified. Messages with answers prepaid constitute the first class; those calling for repetition of other messages for verification, the second; then come special-delivery messages; messages to be delivered by mail; multiple messages, in which the same message is sent to several different addresses; messages calling for the date and hour of transmission of other messages from coast stations to vessel; and paid service messages, sent to rectify or complete addresses and text in prior messages. The new classification was adopted by the London International Radiotelegraphic Convention, and became effective in the United States upon presidential proclamation, September 1, 1913.

¶ More than 33,000,000 passengers were carried by the passenger steamboats of America during 1913, without the loss of a single life.

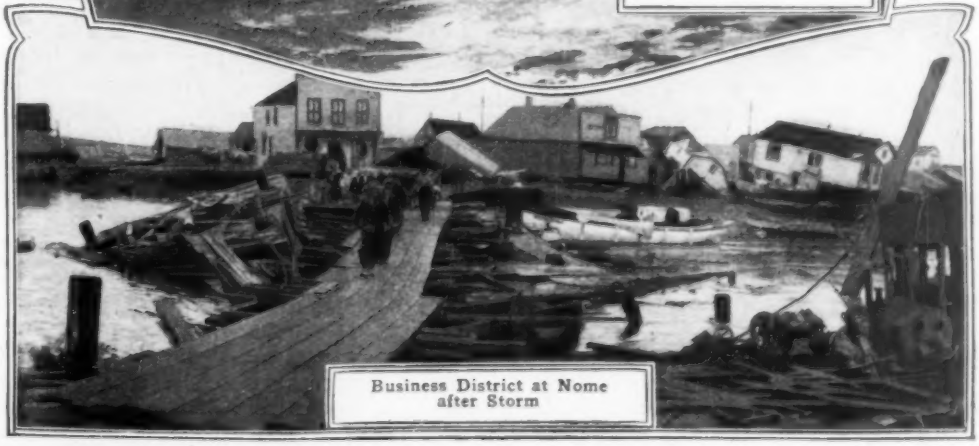
CITY BUILT UPON THE SAND WRECKED BY STORM

The terrific storm which swept the eastern shores of the North Pacific on October 6, 1913, wrought damage almost beyond computation to shipping and to docks. Nowhere was the fury of the tempest more in evidence than at Nome, the once famous mining camp of Alaska. Nome was a city of the flimsiest construction, built upon the beach; a city of boards and shingles, without brick walls or brick chimneys, and entirely unprotected from the sea. Each winter the ice floes piled high upon the sands made harbor improvements impossible. When the storm of last October drove the sea over the long, sloping beach, the waves found their progress unimpeded, and beat down the flimsy shacks, destroyed the frame stores and left a straggling line of wreckage along the coast. Boats driven ashore reposed in devastated streets, while houses floated from insecure foundations to adjacent sites, crushing other buildings as fragile as themselves. The loss of life was insignificant when the completeness of the destruction of the city is considered.

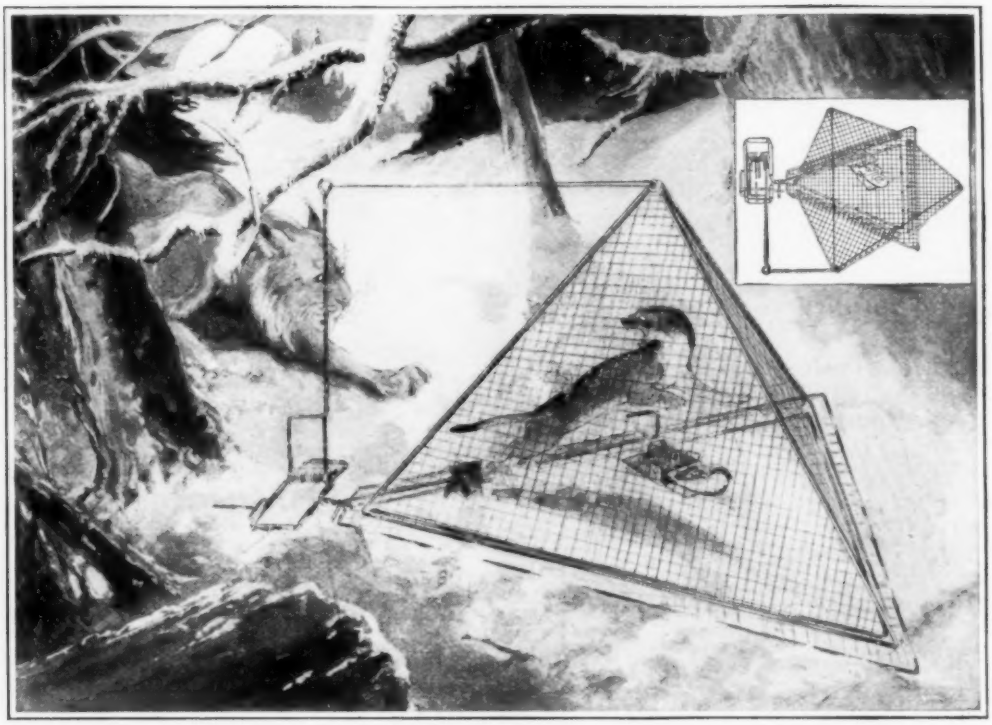
The Wreck of the Board of Trade

Steamer Marooned in Devastated Street

Scene on the Beach at Nome, Alaska, after the Great Storm That Devastated the City



Business District at Nome after Storm



A New Principle in Game Traps

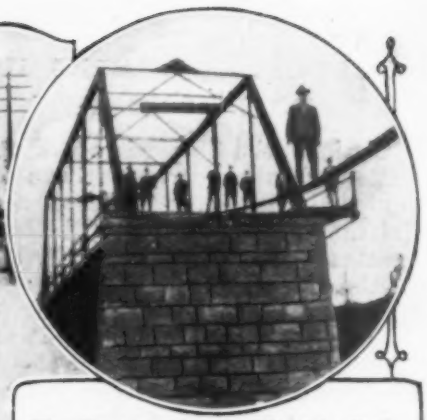
HUMANE TRAP INVENTED BY HEALTH OFFICER

A patent has been granted to a health inspector of Colon, C. Z., on a trap designed to catch animals alive. Primarily it was sought to catch rats alive, for investigation of the bubonic plague developed the fact that the fleas on rats, which constitute the infecting agent in plague, leave the rat soon after it dies. But the trap, as built, admits the capture of any animal, bird or fish. The trap, when closed, forms a pyramidal cage of wire netting; when open, it lies flat on the ground, and may be easily concealed with leaves and grass. A pan in the center contains the bait, and springs throw up the wings of the trap when the bait is disturbed. Inclosed in the cage, the animal is not only not injured, but is protected from attack by other animals while imprisoned. This novel trap, which is made in various sizes, has the endorsement of humane societies.

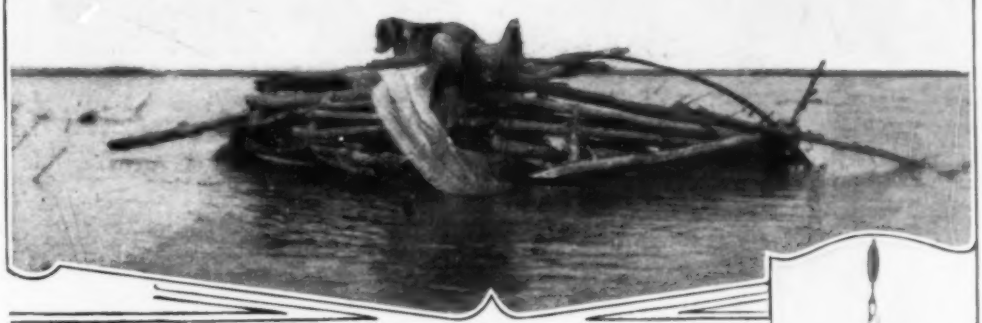
TEXAS RIVERS RAGE IN DISASTROUS FLOOD

Central Texas was overwhelmed by a disastrous flood the first week of December, 1913. The Brazos, the Colorado and the Guadalupe rivers rose until many lives were lost and property of great value was wiped out of existence. Levees were washed away, and rich farming lands inundated. Railway traffic was suspended, in some counties every bridge being either badly damaged or destroyed. The path of the flood varied from 50 to 150 miles in width, and extended from the Red River on the north to the Gulf. Waco, Hearne, Bryan and Houston were among the cities of the state which bore the brunt of suffering and loss. Smaller towns and the farming districts were without food or succor for a week or more, while aid from citizens outside the flooded section could be sent to those who needed it only with the greatest difficulty.

Rescuers Paddling through the Streets of Waco, Texas, Inundated by December Flood



Wire Netting and Planks Used for Temporary Repair of Washed-Out Bridge



Castaways of the Texas Flood: A Dog and a Hen Afloat on Driftwood. Above, View of Flooded District, East Waco

Marooned by the Flood: A Family Seeking Refuge from the Waters on the Roof of Their Cabin

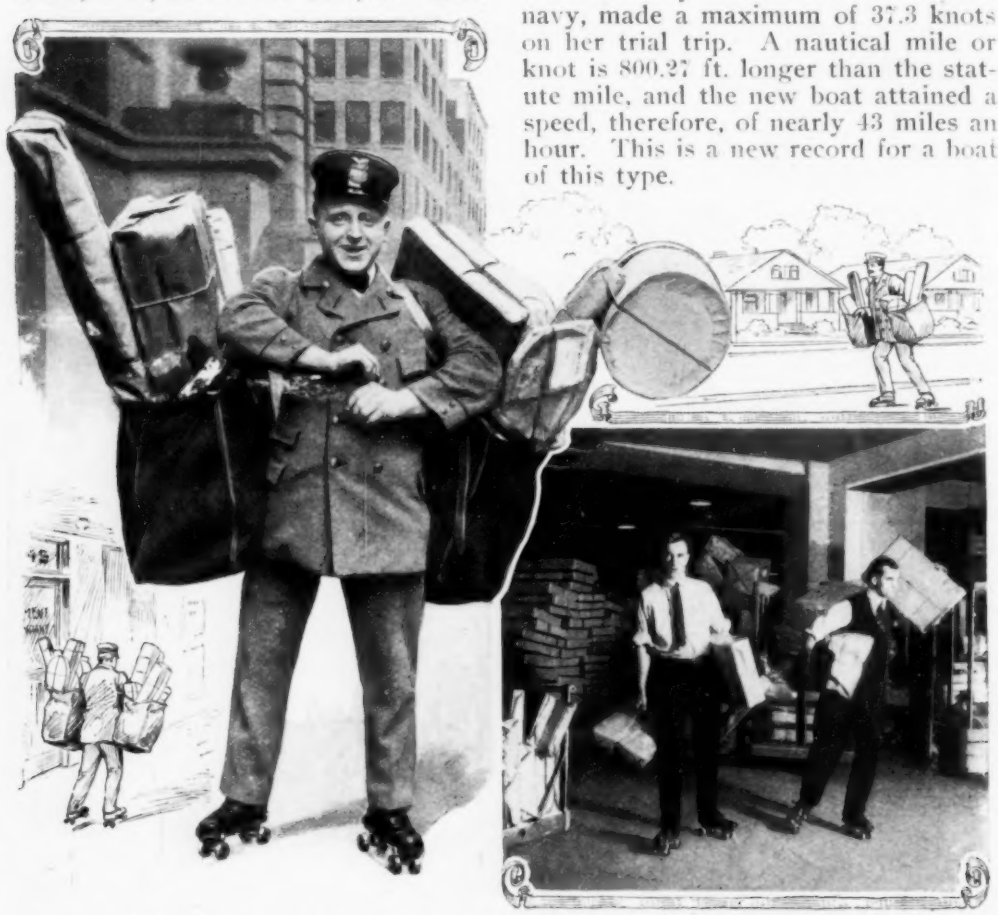
Launching Lifeboat from Railway Train

POST-OFFICE CLERKS USE ROLLER SKATES

Clerks in the Chicago post office and some of the carriers have been equipped with roller skates in the belief that the innovation will result in greater speed in the transaction of routine business and the elimination of considerable effort in walking. An article in a recent issue of this magazine told of the use of roller skates by stockroom employes in a large factory, and this suggested their use in the postal service. The post-office check room is in the basement and has a clear stretch of concrete floor space 300 ft. long. Here the clothing, uniforms, hats, and shoes of 1,400 clerks are hung, and the running back and forth amounts to several miles every day. Several pairs of roller skates were bought and given to the employes in the check room. It was soon found that they did their work with less effort and in one-third of the time it had taken them to run back and forth. The roller skates proved so great an aid on the inside that the postmaster decided to experiment further, and several of the special parcel-post carriers were also equipped with skates.

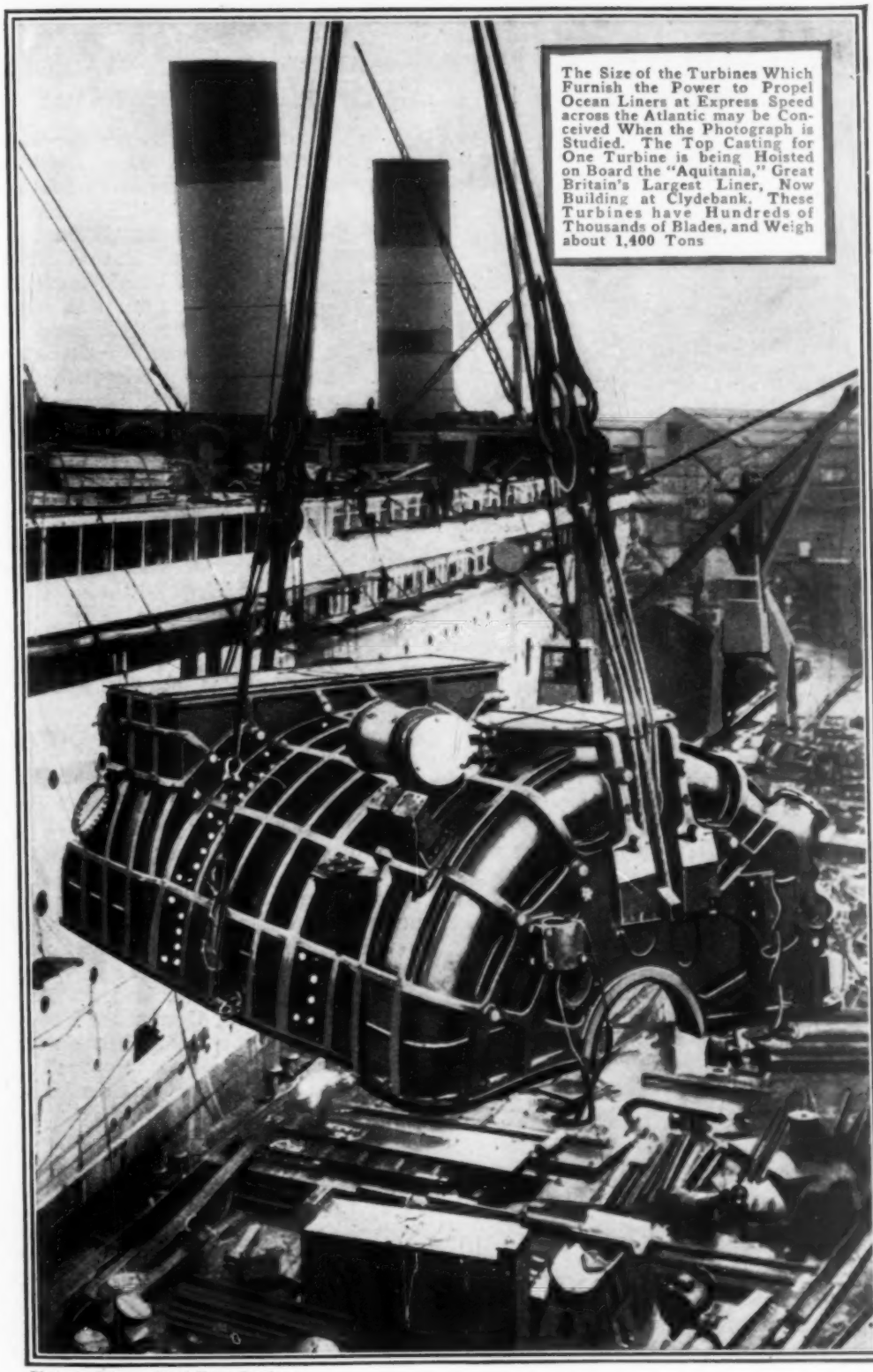
RUSSIAN DESTROYER SETS NEW SPEED RECORD

The torpedo-boat destroyer "Novik," recently built for the Russian navy, made a maximum of 37.3 knots on her trial trip. A nautical mile or knot is 800.27 ft. longer than the statute mile, and the new boat attained a speed, therefore, of nearly 43 miles an hour. This is a new record for a boat of this type.



Roller Skates Prove Useful Both Inside the Postoffice and for Parcel-Post Carriers

Photo by International News Service



The Size of the Turbines Which Furnish the Power to Propel Ocean Liners at Express Speed across the Atlantic may be Conceived When the Photograph is Studied. The Top Casting for One Turbine is being Hoisted on Board the "Aquitania," Great Britain's Largest Liner, Now Building at Clydebank. These Turbines have Hundreds of Thousands of Blades, and Weigh about 1,400 Tons

Photo by International News Service

FLEXIBLE SIDECAR FOR MOTORCYCLES

Designed to relieve the motorcycle of all strain, and to insure comfort and safety for both rider and passenger, a new type of sidecar has been invented. The new design avoids the difficulty met with in ordinary types, in making right and left-hand turns, riding over rough, muddy and slippery roads, by means of a flexible connection to the motorcycle and a compensating device with floating-spring action. This controls the sidecar's wheel, relieving side pulls and skidding.

New Sidecar with Flexible Connection, Permitting Easy Adjustment to Rough Roads

DEMAND FOR IRIDIUM INCREASING

As an alloy for hardening platinum, iridium, which was formerly used only for the points of gold pens, is now being extensively employed. Pure platinum is now rarely used, and iridium, which was once less costly than platinum, has now almost doubled in price.

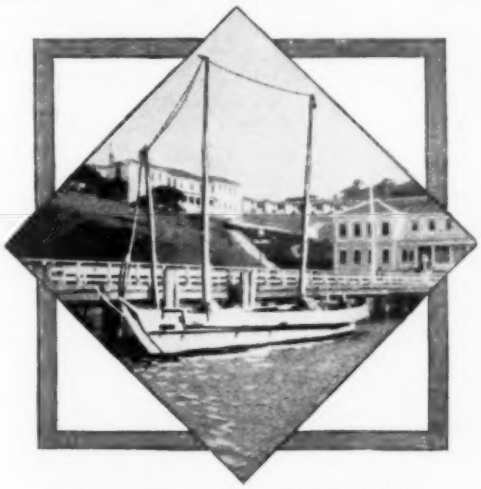
TUNNEL LINKS CONTAGIOUS WARDS WITH HOSPITAL

In the newest hospital for the treatment of contagious diseases, built at Evanston, Ill., barriers as intangible as those separating Canada from the United States divide patients suffering from one communicable disease from those afflicted with another. A famous Paris hospital recently demonstrated that patients might be treated in the same ward without cross-infection. The plan adopted at Evanston is an application of this discovery. White lines painted on the floor between the beds mark areas from which nurses and physicians must not step into any other areas without observing certain precautions.

Thus, a nurse, after treating a patient suffering from one infectious disease, must change her infected robe, wash her hands and don a fresh robe before stepping into another area in the same ward, to handle or treat a patient afflicted with a different communicable sickness. The idea that disease germs are capable of locomotion is combated. Germs are shown to be quiescent, increasing only on certain media, but in no sense propelling themselves to a distance, or rushing out like a bulldog to bite an intruder. In the new hospital at Evanston, the contagious-disease building is separate but not isolated from others in the group. A tunnel, 298 ft. long, connects the new building with the others. It is open from one end to the other with a free flow of air throughout, and no fear is felt that contagious disease will be communicated to patients in other buildings.

JAPANESE CROSS PACIFIC IN SMALL BOAT

The sampan is an Oriental craft of from 10 to 15 ft. in length, housed over and often used as a permanent habitation in inland waters. Recently 16 Japanese sailed in a sampan from near Yokohama for America, and crossed the Pacific in 53 days, landing near Point Arena. Immigration authorities, however, took them in charge and brought their boat down to San Francisco. The picture shows a frail craft to dare a passage of 5,000 miles.



Japanese Sampan Which Carried 16 Men across the Pacific

MAN-EATING LIONS MENACE TO RAILWAY BUILDERS

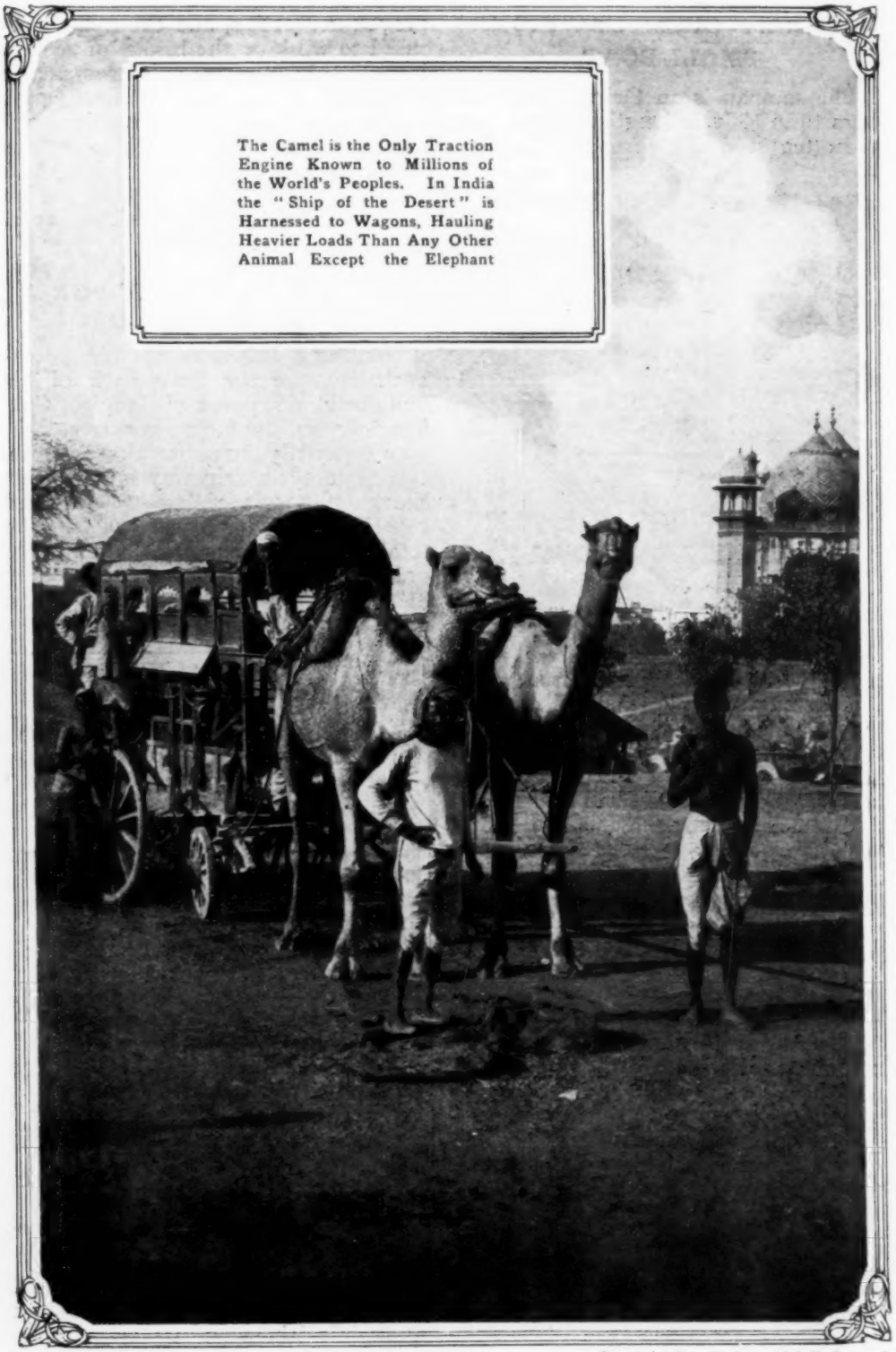
Frequent danger from man-eating lions has proved to be a serious thing in the construction of the Cape to Cairo Railway in Africa, and work on one important structure, the big bridge over the Tsavo River, was actually brought to a stop and kept at a standstill for a considerable period by the inroads of these persistent beasts. Shortly after the construction camp had been formed on the east bank of this river a number of man-eating lions appeared on the scene, attacking the sleeping natives during the night and bearing them off into the jungle. Elaborate precautions and defenses proved ineffective, and the natives refused to work on the bridge or remain in the neighborhood. It was finally necessary to organize a campaign, on the order of a military campaign, and hunt down the lions in their fastnesses in the jungle. Before the vicinity had been cleared of this terror, 29 Indian workmen and an unknown number of natives had been killed.

NARROW DRIVEWAY FOR A MOTORCYCLE

Needing a driveway for his motorcycle to save the lawn back of his bungalow, a resident of Tropico, Cal., has designed and built a concrete pathway especially fitted for the purpose. His motorcycle driveway is just wide enough for safe riding—18 in.—and stretches across his lawn for 90 ft. The total cost of the runway, built like an ordinary cement sidewalk, was only $12, about one-fourth the cost of the usual wide driveway. In laying it, the builder has left room for a parallel strip at the proper distance, to form an automobile driveway.

Cement Driveway Especially Designed for a Motorcycle

CURIOUS VEHICLES IN USE THE WORLD OVER—1



The Camel is the Only Traction Engine Known to Millions of the World's Peoples. In India the "Ship of the Desert" is Harnessed to Wagons, Hauling Heavier Loads Than Any Other Animal Except the Elephant

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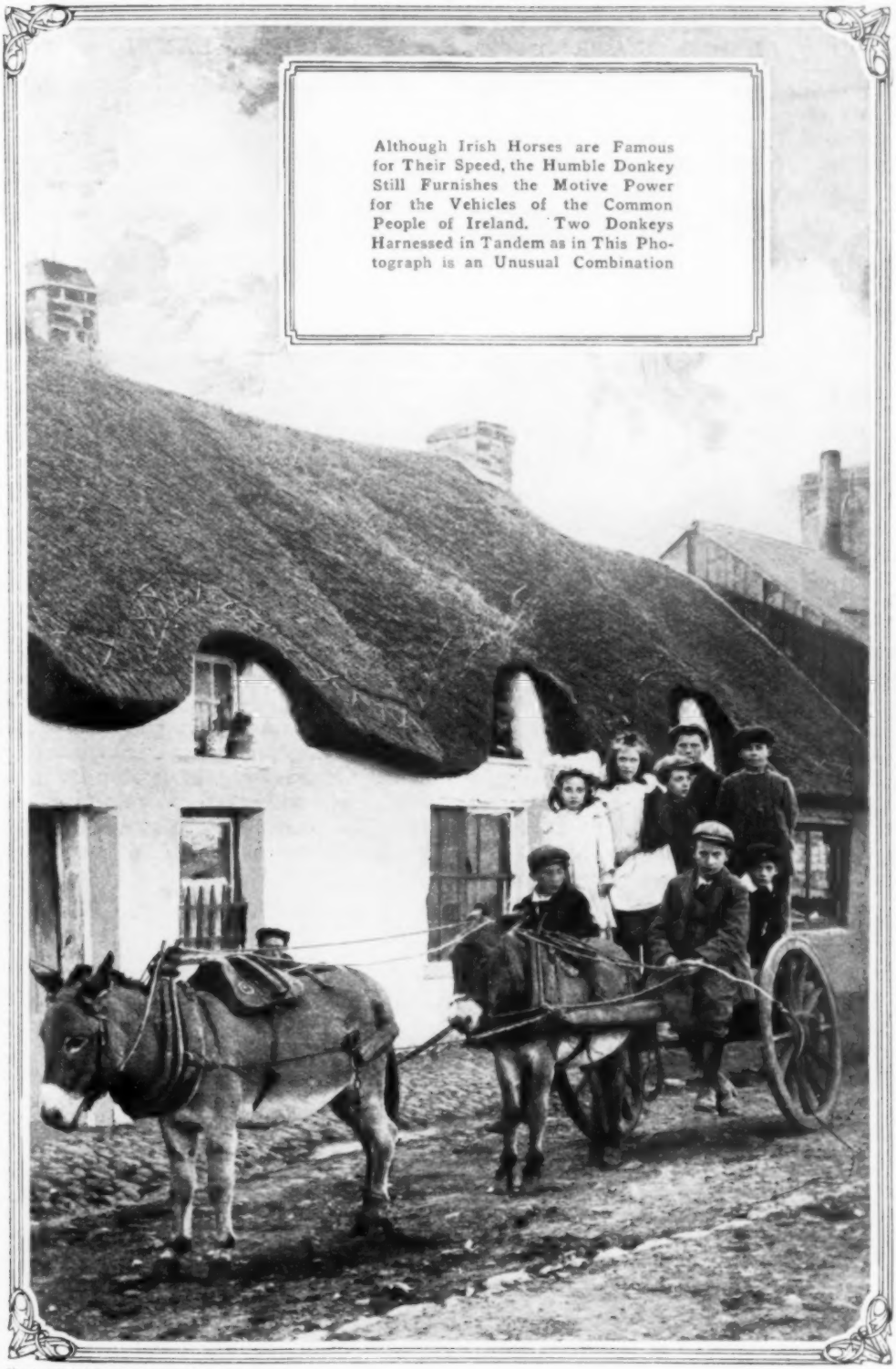
CURIOUS VEHICLES IN USE THE WORLD OVER—2



Although Irish Horses are Famous for Their Speed, the Humble Donkey Still Furnishes the Motive Power for the Vehicles of the Common People of Ireland. Two Donkeys Harnessed in Tandem as in This Photograph is an Unusual Combination

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NEW TYPE OF COMPOUND ARMOR PLATE

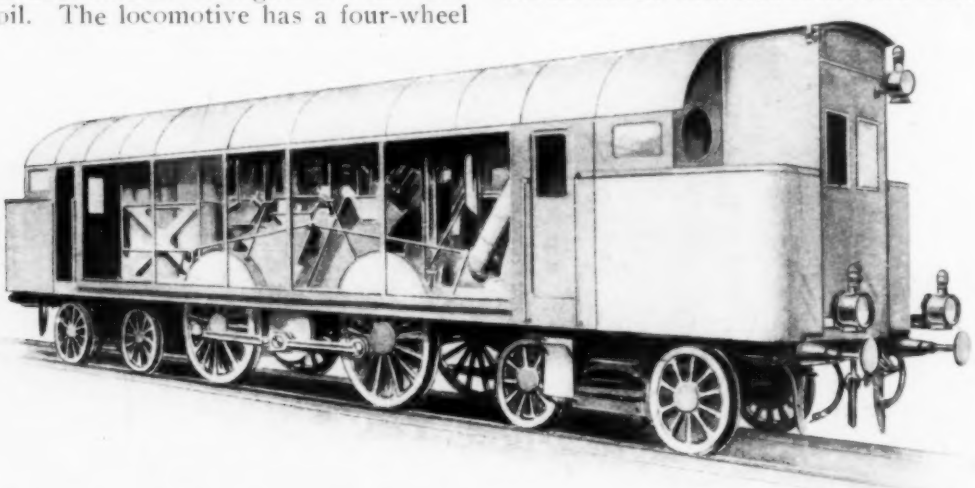
The demand for armor plate that will offer protection against the fire of modern military rifles and still will be light enough to be readily transported by troops on land has led to the development of shields and armor of many types. One of the latest inventions in this line is the work of a German, who combines a nickel-steel plate with one of duralumin, and joins the two tightly by a great number of steel bolts. The double plate is very much lighter than would be one of steel of the same thickness, while the duralumin backing is said to add toughness and freedom from splintering to the hardness of the steel facing.

MORE STEAMSHIP LINES FOR THE ATLANTIC

A new line of steamers is planned to run from Blacksod Bay, Ireland, to Halifax and Boston. The scheme contemplates harbor improvements at the Irish port and a channel ferry between England and Ireland for the conveyance of cargo to Blacksod. Another line proposed is between Gothenburg, Sweden, and the United States, consisting of two 18,000-ton steamers, with the American terminal at Boston. A freight and passenger service is projected between New Orleans and Italian ports, Naples and Palermo, under the auspices of the Navigazione Generale Italiana, with first sailing early this year.

A NEW TYPE OF RAILWAY LOCOMOTIVE

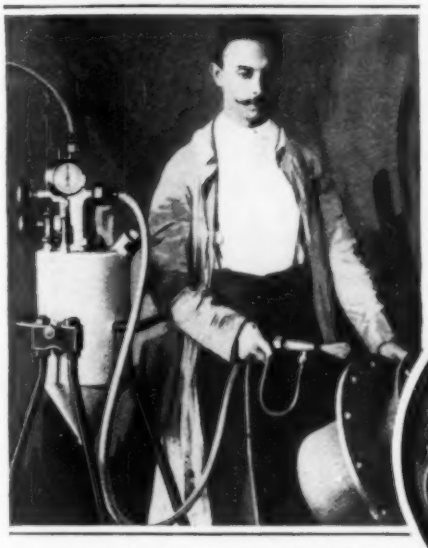
While steam and electric locomotives are contending for supremacy on American railroads, an entirely new type of railway locomotive has appeared in Germany and has been put into regular service hauling express trains between Berlin and Magdeburg. It is called the Thermo Locomotive and is propelled by a Diesel internal-combustion engine fed on crude oil. The locomotive has a four-wheel driving truck in the center and a small pilot truck at each end. Mounted on the driving truck is a powerful V-shaped Diesel motor operating a shaft from which power is carried to the driving wheels by short connecting rods. Driving cabs have been built on both ends so that the locomotive can run in either direction, and oil tanks are carried on each side of the two cabs.



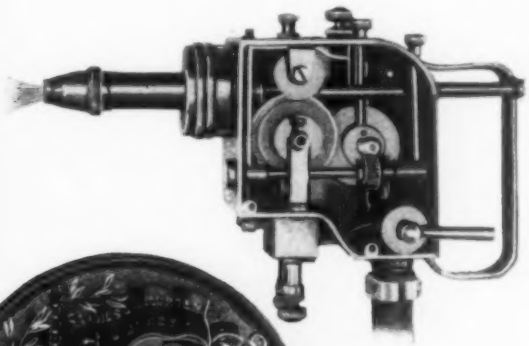
A New Type of Railway Locomotive:
The Thermo Locomotive Propelled by an Internal-Combustion Engine

PLATING WITH A SPRAY OF MOLTEN METAL

Metal spraying is a new process which has recently appeared in Germany to take the place of electrolytic metalplating. It is not limited to metalplating, but can be used for depositing a film of metal or glass upon wood and other substances. The special apparatus used in the process is a nozzle, like a blowpipe, for producing an oxyhydrogen flame. The metal or glass to be sprayed is fed into the center of the flame in the form of a wire passing through the nozzle. As the flame comes in contact with the end of the wire it melts off small particles of the metal and deposits them in the form of a spray upon the object to be plated. Besides its industrial use in metalplating, the process has a place in the arts in the making of medals and bas-reliefs.



Apparatus Used in New Process of Plating with a Spray of Molten Metal



The Nozzle Consists of an Oxyhydrogen Flame Which Melts and Sprays Small Particles from the End of a Wire

Medal Made by Spraying Metal upon a Hollow Mold

MARINES TO HANDLE TRAINS IN ENEMY'S COUNTRY

In order to have men available in the military service for handling trains in the transportation of troops in an enemy's country, the War Department has arranged to have the marines stationed at Panama systematically trained in all features of train operation. Marines are now riding back and forth across the isthmus on the regular passenger engines of the Panama Railroad and are being instructed by the engineers in everything relating to engine running, air-brake operation, and the handling of trains.

MOVING PICTURES REVEAL LIVING-CELL FORMATION

The Society of Biology in Paris recently watched a moving-picture film in which the formation of living cells was shown. Tadpoles which had been subjected to a fast for several weeks were fed and drops of their blood placed under the cinematograph. The pictures plainly showed the blood corpuscles forming and then dividing, revealing the phenomena of the growth of animal matter.

¶The ordinary crew of one of the big transatlantic liners numbers over 800.

NEW TYPE OF MAIL BOX RECENTLY ADOPTED

A distinct saving of time is claimed for a new quick-emptying mail box lately adopted after exhaustive tests by the postal authorities. Somewhat larger than the boxes it is designed to supersede, its principal point of difference is that when fully opened, the bottom drops down at an angle of 25° so that the contents will slide, without handling, into the waiting automobile or carrier's bag. The box, filled with mail, can be emptied in 12 seconds, while the old box, from which the mail must be taken by hand, requires fully two minutes. Another departure is that the letter drop is pivoted so that a slight pressure will open it. A handlebar extends across the top, instead of the small protrusion on the old boxes, and with this handle the drop may be opened with an umbrella or the pressure of a package. The opening of the drop is larger, admitting an envelope 12 in. long. Within the box is a guard which prevents robbery when the drop is open.

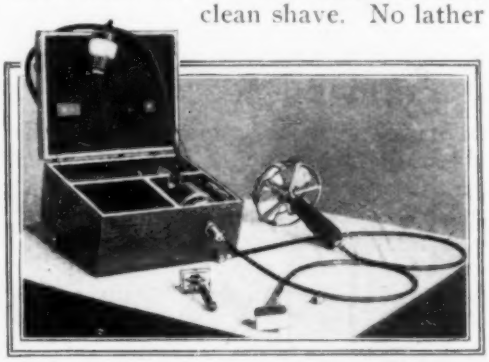
Quick-Emptying Mail Box Adopted by the Post-Office Department

TO BUILD HIGHWAY TUNNEL UNDER HUDSON RIVER

A highway tunnel under the Hudson River at New York City, connecting the highway systems of New York and New Jersey, is proposed by the Bridge and Tunnel Commissions of the two states instead of a bridge. There is but one bridge across the Hudson, south of Albany. That is at Poughkeepsie, 75 miles above New York City. The project for a bridge from Manhattan Island to the New Jersey shore has been agitated for a hundred years, but the great height at which it would have to be built to give sufficient clearance for shipping, and the value of the land that would have to be taken for terminals, would make a serviceable bridge cost $50,000,000, the commissions estimate, while a tunnel with two tubes, each having a 17-ft. roadway, could be built for $11,000,000. The average number of vehicles crossing the Hudson in ferryboats is 19,660 per day. All but 2,000 of these cross below Twenty-third Street, and to make the highway tunnel accessible to this traffic it will have to be built below that point. A tunnel such as proposed would have a capacity of 5,000,000 vehicles a year, or about the number now crossing the river. Mechanical ventilation and means for maintaining perfect cleanliness are included in the plans.

ELECTRIC SHAVING DEVICE FOR SAFETY RAZOR

An invention which is devised to facilitate shaving with a safety razor has an electric attachment by means of which the razor blade is given a vibratory motion, cutting the hair by blows, instead of the usual sliding stroke. The small motor may be set to give a very large number of revolutions per second, and it does not take more than two or three minutes for a clean shave. No lather is necessary, a wetting of the skin being sufficient. The motor plugs into any lamp circuit.



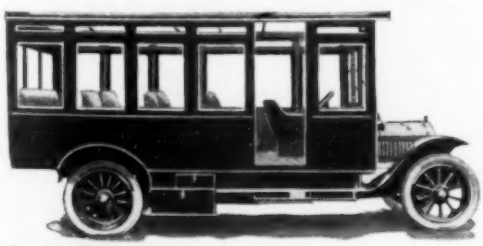
Novel Toilet Set, with Safety Razor and Fan Attachments

GERMAN RAILROAD TO BE BUILT ON SAND DUNES

A railroad is to be built from Cranz to Schwarzort, in Prussia, along the Kurische Nehrung, a narrow spit of land that separates the Baltic Sea from a salt-water lagoon known as the Kurisches Haff. This peculiar land formation is 72 miles long and from one to two miles wide, and is fringed with sand dunes, many of which rise to a height of 200 ft. The railroad is remarkable in that it will be built for the greater part of the distance on these sand dunes, which show a constant tendency to shift their position. On the Kurische Nehrung are located a few fishing villages and a great many summer resorts, and it is to serve the latter that the railroad is to be built.

GLASS ROOF NOVEL FEATURE IN MOTOR BUS

An innovation in motor-bus design is shown in Boston where a recent model, replete with new features, has a roof of wired glass, flooding the interior with light. The bus has a capacity of 22 passengers and all seats are built transversely. Opposite each row of seats is a window which is detachable, and when not in use is stored in a special cabinet beneath the chassis frame. Extra tires also are carried in a cabinet instead of on the frame.



Courtesy Motor Age
Well Lighted Motor Bus with Glass Roof

MOTOR SLEIGH BREAKS SNOW ROADS

A motor sleigh, designed expressly for the "breaking" of snow roads, was placed in operation last winter in and around Waterville, Maine. The road breaker is mounted on runners at the forward end and has endless-chain, spiked wheels at the rear. A snow-plow, hitched to the rear, throws the snow many feet away, making a clear surface. The machine, driven by a 60-hp. engine, makes 12 miles an hour.

Cleaning Roads of Snow with a Motor Sleigh

PARCEL POST WILL HANDLE LARGER PACKAGES

A ruling of the Postmaster-General, recently approved by the Interstate Commerce Commission, increases the weight limits of parcel-post packages, in the first and second zones, from 20 to 50 lb.; admits books to the parcel post, and reduces rates in the other zones materially. The maximum weight for parcels in all zones beyond the second was increased from 11 to 20 lb. From the already published rates the reductions are as follows: In the third and fourth zones, 1 cent less on the first pound and 3 cents less on each additional pound; in the fifth and sixth zones, 1 cent less on each pound sent. Parcels containing books weighing 8 oz. or less will be carried anywhere for 1 cent for each 2 oz., and on those weighing more than 8 oz., the parcel-post rate for the zone shall apply.

A Tragedy of the Great Lakes — Wreck of the 500-Ft. Freight Steamer "Charles S. Price," Floating Keel Up in Lake Huron. The Small Boat to Which the Arrow Points Gives a Good Idea of the Immense Size of the Capsized Vessel

AUTUMNAL STORMS SCOURGE GREAT LAKES

With every autumn come disastrous gales sweeping the Great Lakes and often bringing heavy loss and many deaths in their train. The storm which swept the lakes in November, 1913, was, however, the most severe in the history of steam navigation on the lakes. A gale of hurricane force came out of the north without warning and sent a score of vessels to the bottom, while 244 sailors lost their lives and property valued at many millions was destroyed. Practically all the damage was done in Lake Huron, "the graveyard of the Great Lakes." The lost ships had no wireless equipment.

Eight miles north of Port Huron, Mich., a huge steel freighter was found half submerged, bottom upward, only part of the forward end above water. A hundred feet of steel keel and sheathing could be seen, but no name nor marks by which she could be identified. Strewn on the shores of the lake was wreckage from a half dozen large lake craft telling grim tragedies of the storm, but giving no clew to the mysterious ship which had "turned turtle" in the gale.

It required the services of a diver to solve the mystery. After the waves had subsided and the fog had cleared away, a vessel with proper equipment approached the unknown wreck and a diver was sent down to explore the interior. He brought back word that the vessel was the "Charles S. Price," a modern steel freighter, 504 ft. long, originally carrying a crew of 28 men. Investigation proved that the hatches had been washed away and the water, pouring into the hold, turned the ship on its side, when the force of the gale sent the whole ship over. While she did not sink at once, every soul on board was lost, her firemen and engineers drowning in the engine room. The wreck floated for 48 hours after being discovered and identified, then sank as the confined air in the hull gradually leaked out, which alone had kept the wreck above water.

BEAUTIFUL MONUMENT TO COMMEMORATE MIRACLE

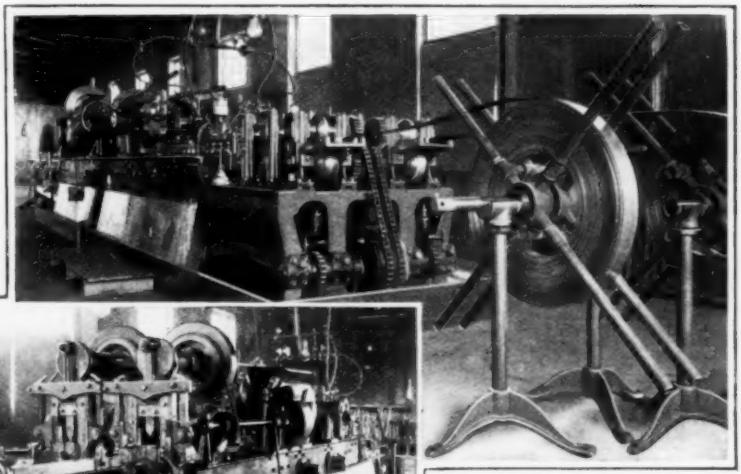
In granite and bronze a memorial shaft has been raised in Salt Lake City by the descendants of the Mormon pioneers who fled across the Great American Desert to found a colony in the wilderness, commemorating the providential appearance of a flock of gulls at a moment when a plague of crickets had threatened the very existence of the infant colony. The monument consists of a slender shaft rising from the pedestal and crowned by a huge granite ball, surmounted by bronze gulls, with outstretched wings. Suitable tablets on the base of the monument portray the dramatic rescue of the pioneers from famine, and a fountain, 40 ft. in diameter, surrounds the base. A simple tablet bears the legend: "Erected in Grateful Remembrance to the Mercy of God to the Mormon Pioneers."

MODERN THEATER TO BE BUILT IN MANILA

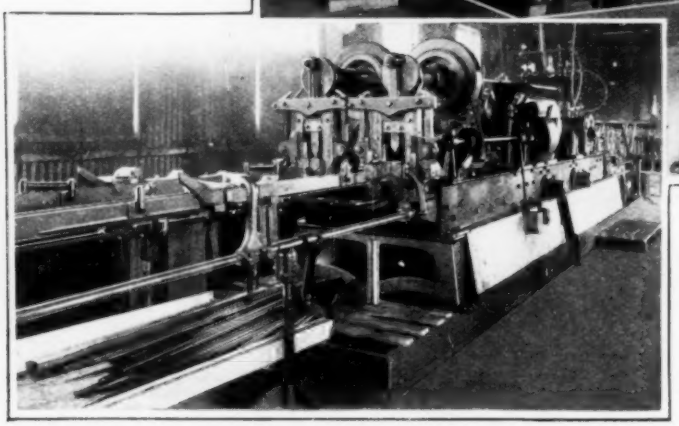
A modern theater to cost about $250,000 when fully equipped, and having a seating capacity of about 1,500, is to be built at Manila, P. I., on land leased from the government. The building will be a five-story structure with roof garden and will have the most modern equipment. The auditorium is to be automatically cooled by chilled air.

AUTOMATIC MACHINE FOR MAKING STEEL TUBES

A new machine does away with the numerous operations now necessary in making seamless steel tubes and combines all in one continuous operation. Each step in the process of manufacture is automatic, from the forming and welding to the final cutting of the tubes to the required lengths. This machine will, it is claimed by the inventor, turn out finished tubes at the rate of 4,000 ft. per day, while, by adjustments easily made, any shape of tube desired, in diameters ranging from 1 in. to 7 in., may be made. The flat metal strip is first drawn through a series of small rollers and formed into tube shape with a small mandrel on the inside, and emerges from these rollers to all appearances a seamless tube, the edges being even and tight. It then passes through a device which holds it in position while the edges of the metal are welded together by the oxyacetylene process, after which the burr is removed with a knife and the tube is smoothed with an emery wheel. The next process is that of sizing and polishing, which is done by cold-rolling with water. The tube then passes through a straightening device and is finished by being cut to the required length. These operations are all performed by the one machine, which occupies a floor space 3 ft. wide and 20 ft. long.



How the Sheet Metal is Fed into the Tube Machine



The Other End of the Machine, Where the Finished Tubes are Deposited

COOLING GAS ENGINES WITH INJECTED WATER

A new system of water-cooling for internal-combustion engines has been developed recently by an English engineer, as a substitute for the water jacket. The cooling is effected by squirting water on the inside surfaces of the cylinder from a spray in the cylinder head. It goes further than introducing water with the charge of gas, as is done in some oil engines, for that merely lowers the temperature of the gas without cooling the cylinder walls; it sprays water in a stream of sufficient size to strike the metal in liquid form. The water is injected through a hollow "rose" casting, with 25 holes of $\frac{1}{40}$ in. diameter on all

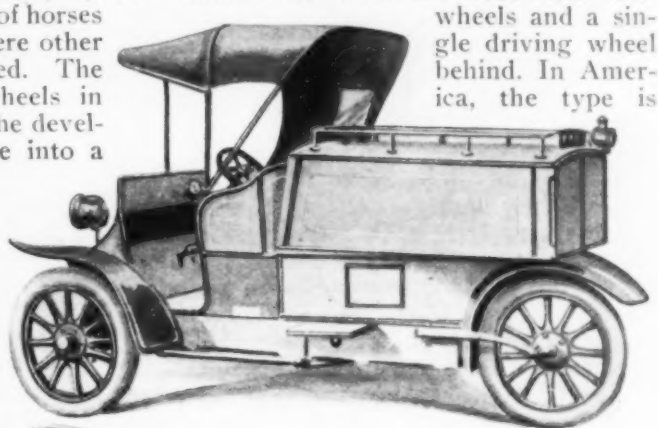
sides, and a pump connected with the cam shaft. As the most heat is transmitted to the cylinder walls at the moment of explosion, the spray is not continuous, but is regulated to flow just at the point of ignition when the piston is near the head of the cylinder. The temperature of the metal is also kept above 212° F. so that the water boils as soon as it strikes the metal. In this way no water touches the lower part of the cylinder or any of the sliding surfaces, and the spray causes no corrosion or lubrication difficulties. Cooling of the lower part of the cylinder is accomplished by convection of heat through the piston into the cooler cylinder head. The new system of cooling has been tested on a 40-hp. gas engine, with a cylinder of 21-in. stroke and 11½-in. bore. The water-jacketed cylinder was replaced by a smooth-bore casting with a water jet in the head. During the last two years the engine has run some 5,000 hours and has developed from 43 to 50 hp. without overheating and with no more than the usual corrosion or wear. Besides cooling the engine the spray reduces the pressure of the charge enough to make the explosions almost inaudible.

¶A jelly for table use is made from the waste resulting from the manufacture of ivory into various articles. This ivory dust is boiled 8 or 10 hours, and the product, when strained, is a clear jelly which may be flavored to taste.

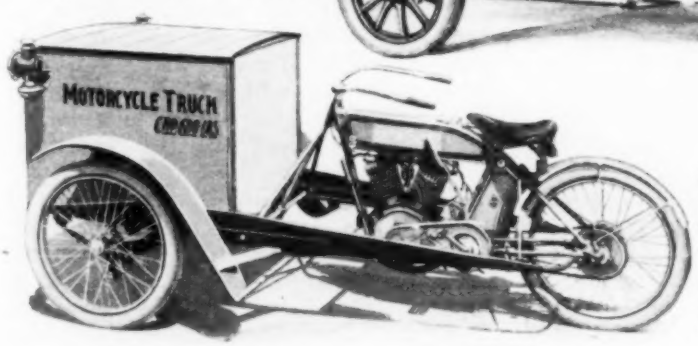
¶The refrigerator ships of the world number 171.

THREE-WHEELED DELIVERY TRUCKS

Light three-wheeled motor trucks, driven by a single rear wheel, are beginning to take the place of horses in light-delivery work where other heavier vehicles have failed. The latest type, with two wheels in front, is the last stage in the development of the motorcycle into a commercial vehicle and comes after many experiments with unwieldy sidecars, complicated drive by two rear wheels, etc. In England, the three-wheeler has appeared in the form of a converted automobile with the seat over the wheels and a single driving wheel behind. In America, the type is represented by a motorcycle in which the front wheel is replaced by two wheels and a carrier box. The American machine is built to carry 600 lb. in addition to the driver and has a wheel base of 76



English Three-Wheeled Light Truck, Driven by the Rear Wheel



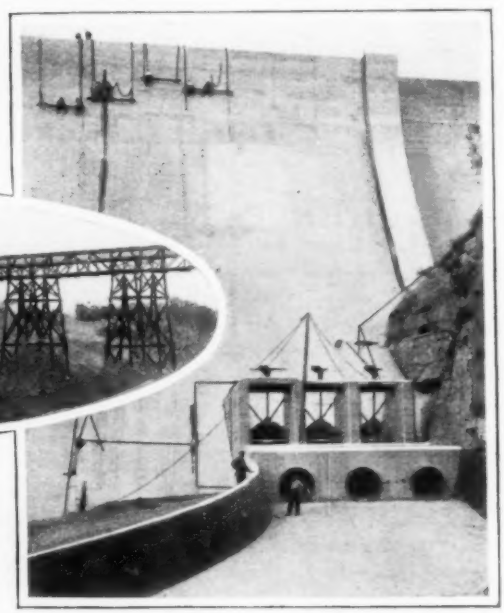
American Motorcycle Converted into a Three-Wheeled Light Delivery Truck

in., a tread of 56 in., and 3-in. tires. It has two-speed gear and a free engine clutch, so that the engine can be started with the pedals. While the carrier box is placed over the front wheels, an underslung chassis distributes the load evenly. The truck will run from 40 to 45 miles on a gallon of gasoline, and in a recent test it was able to cover a 14-mile parcel-post route in half the time used by the regular horse and wagon.

ANOTHER GREAT IRRIGATION DAM COMPLETED

Second only to the great Roosevelt Dam, near Phoenix, Ariz., is the barrier erected in the Medina Valley, near San Antonio, Texas, whereby a tract of 60,000 acres in a plain country will be brought to productiveness through irrigation. Towering 164 ft. above water level of the cañon, the Medina Valley Dam contains over 300,000 cu. yd. of concrete. The flood waters of the upper Medina River emerge through a comparatively narrow cañon into the rolling coastal plains of southeastern Texas. The torrential nature of the stream makes necessary an enormous storage capacity of the main reservoir, which is designed for a capacity of 300,000 acre-feet. The project is far-reaching in its plan and the task has been adequately accomplished. The foundations of the main dam lie in the massive level-bedded limestone which forms the cañon walls and all the hills of this district. From the bottom of the lower trench to the crest of the concrete, the dam measures 180 ft. The spillway, 1,200 ft. in length, is over the saddle into an adjoining ravine. The materials, save for the cement, were found at the site. No sand being available, the fines and dust from the crushers were used, and huge boulders, up to 10 tons in weight, were imbedded in the concrete, 10 to 15 per cent of the mass at the bottom consisting of these plums, though toward the top the percentage gradually decreased. Cableways transported the concrete and gravity was used wherever possible to bring the material down to the workmen. Progress was rapid without being hurried, and a record of 40,303 cu. yd. in one month, on 10-hour shifts and with no Sunday work, indicates the speed with which the construction was pushed. The monumental character of the project is seen in the length of the crest, the Medina Dam being 1,580 ft. long, while the width at the base is 128 ft., and at the top, 25 ft. A secondary dam, 50 ft. high, converts the main channel of the river into a narrow lake, four miles in length, and conducts the water from the main dam to the lands along the river bed. From this diversion dam the main canal

Concrete Siphon and Flume Carrying Canal across the River

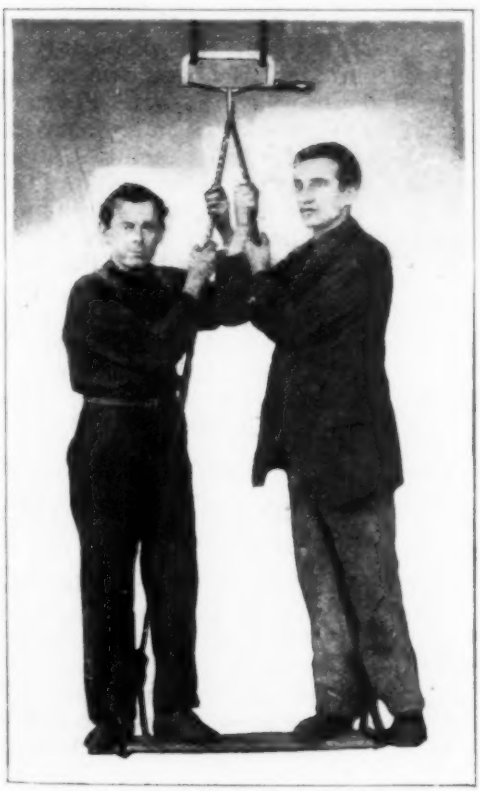


Main Outlet Gates of Medina Dam

extends 24 miles to the head of the distributing system. Siphons of reinforced concrete carry the water the first mile and a half on the west bank, and the canal is then carried across the river in two concrete bores, 8 ft. in diameter, on a creosoted-timber trestle of long-leaf Texas pine, with concrete pedestals.

A REMARKABLE HACKSAW TEST

The exceeding toughness and strength of the steel used in making hacksaw blades was demonstrated recently in an unusual manner. A hacksaw was suspended and from the blade, by means of hook and tackle, a board was swung underneath. Upon this two men, whose weight aggregated 282 lb., stood, the narrow band of steel supporting the burden without breaking.



Slender Hacksaw Blade Sustains Heavy Weight

CHINESE HAYSTACKS ON STILTS

The Chinese farmer must protect his hay crop from floods. And this photograph, taken just outside of the village of Tien Tai, three days' journey inland from Ningpo, shows how he does it. Tall, straight trees are selected in convenient localities and the hay is formed in stacks, or nests, about the trunks at a distance from the ground varying with the locality. These queer haystacks are thatched on top and are impervious to the rain, while all the ground underneath may be covered with flood waters without injuring the hay crop of the neighborhood in the slightest. Some villages have a common stacking ground, which at a distance looks like a village of tree dwellers or the abode of some particularly ingenious wasps.

How the Chinese Keep Their Hay from Floods

COHERENT SPEECH SENT ACROSS ATLANTIC

The first coherent spoken message successfully sent across the Atlantic was transmitted by wireless from Neustadt, Hanover, Germany, to Tuckerton, N. J., recently. The tall wireless tower at the latter place, described in the January number of this magazine, was the receiving station, and the high-frequency Goldschmidt wireless apparatus was used.

¶ In Philadelphia alone there are about 1,400 stationary gas engines in use, aggregating about 12,500 horsepower.

ACCIDENT TO FRENCH INTERURBAN

An electric interurban train near Nice, France, consisting of a motor car with three passenger coaches

Courtesy L'Illustration
Scene of Derailment in France Which Caused Nineteen Fatalities

carrying a number of soldiers, had just reached the viaduct at Torcirol at the end of a curve on a steep grade, when the motor car was derailed. It swung against the parapet, demolishing it. The couplings broke and the passenger coaches plunged down into the ravine, 40 ft. below, while the motor car was left hanging perilously, on the edge of the viaduct. Nineteen soldiers lost their lives in the accident.

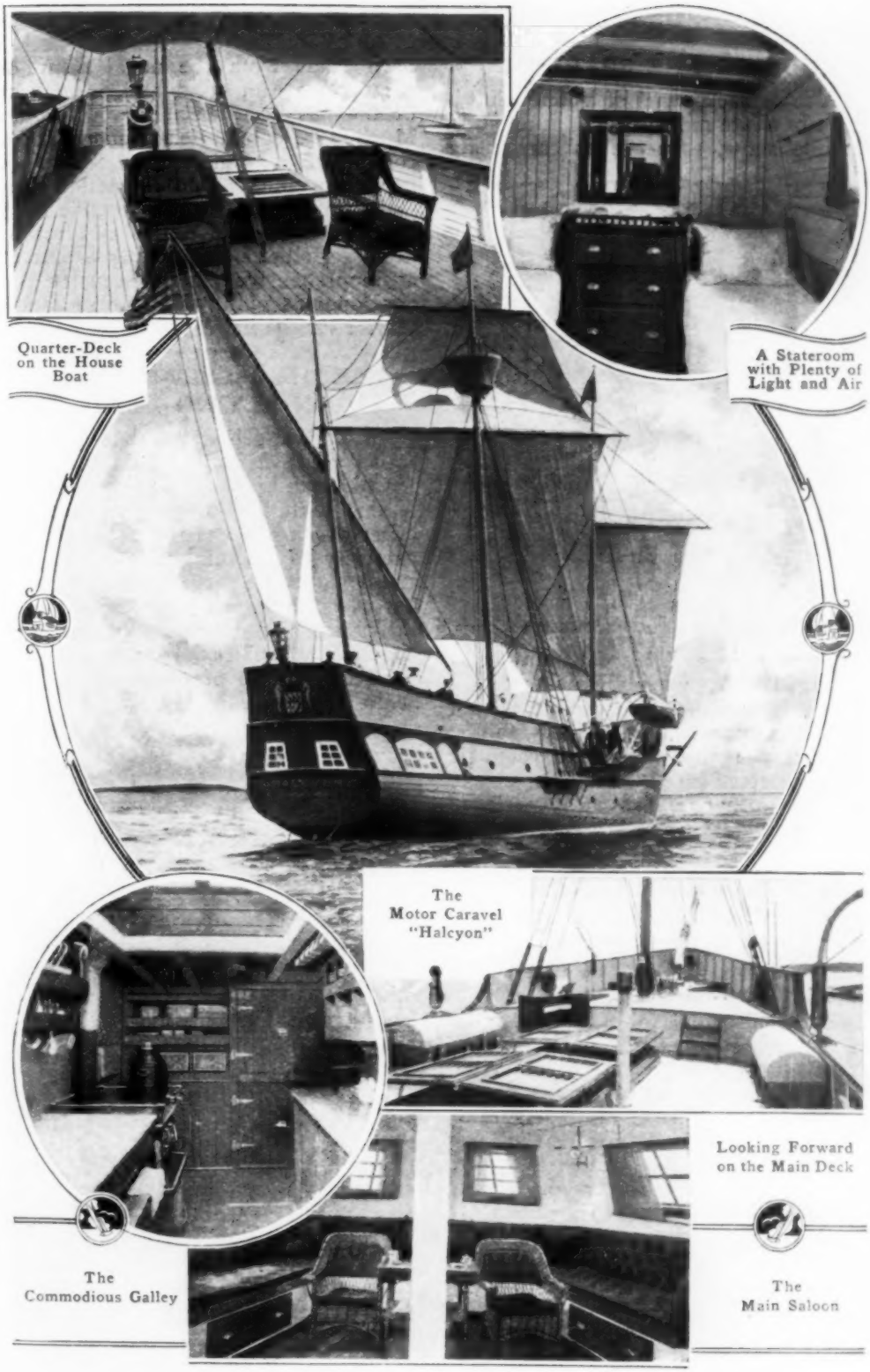
¶The first commercial wireless message between America and Asia was sent recently from the U. S. Army station at Nome, Alaska, to the Russian government station at Anadyr, Siberia.

UNIQUE HOUSE-BOAT REPLICA OF COLUMBUS CARAVEL

Desiring a house boat which should be more picturesque than the box-on-a-mud-scow type so often used, a Boston business man has built the "Halcyon" which reverts to the time when "in 1492, Columbus sailed the ocean blue." In length this craft is 76 ft., and is 21 ft. wide, with a draft of a trifle less than 4 ft. It is three-masted, with a lateen sail on the mizzen, and has figurehead, fighting top and high lantern aft, in the last detail of the old-style ship of the fifteenth century. While it is proposed to use the sails in favorable winds, a 6-cyl., 70-hp. motor has been installed so that the boat will not be at the mercy of calms. The interior arrangement provides the comfort of a house boat, and exceptional convenience has been found possible in this type boat. By carrying out the high quarter-deck and running the sheer well aft, an excellent stateroom has been provided with plenty of light from the large windows at the side and from a transom. Forward of this are two large staterooms for guests, each with toilet facilities. The large main saloon is in the center of the boat, under the main deck, with ample headroom. The galley is just ahead of this, with a stateroom for the captain and steward on the port side. The "Halcyon" is probably the first ship built on these lines since the fifteenth or sixteenth centuries, save for the Columbus caravels built for the World's Fair in Chicago in 1892.

LUBRICATING OIL MIXED FOR WINTER USE

Graphite mixed with cylinder oil until the mass is of the consistency of paste, and then reduced with kerosene until it flows freely, is recommended by an engineering authority for outdoor use in winter where lubricating oil is required. It is claimed that this compound will not stiffen at a temperature of 14° below zero.



Quarter-Deck on the House Boat

A Stateroom with Plenty of Light and Air

The Motor Caravel "Halcyon"

Looking Forward on the Main Deck

The Commodious Galley

The Main Saloon

HOUSING THE SPARE TIRE

A false back panel of a limousine is used in a late model shown at an automobile show, to serve as carrier for

Cupboard Formed in Limousine by False Back Panel

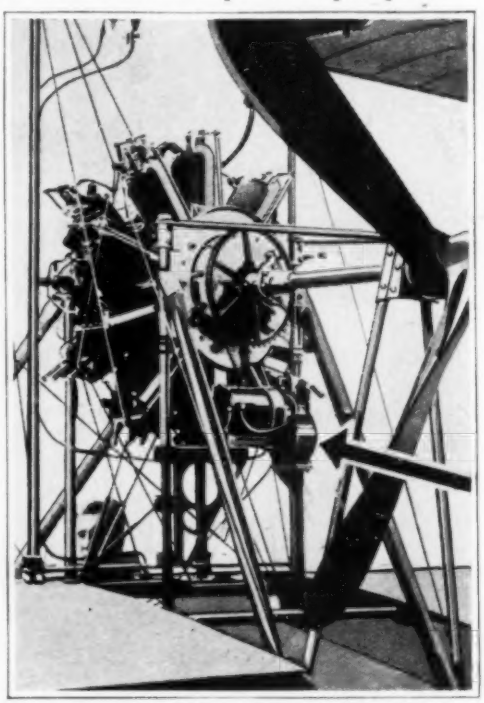
two spare tires. This cupboard is so arranged that when the doors are closed it is almost impossible to tell that the panel has hinged joints. Besides the tires sufficient room is given to store inner tubes, spare rims, or such other extras as experience shows are most necessary on a tour.

DEVELOPMENTS IN NAVY AVIATION SERVICE

The use of the flying boat and the establishment in this country of a national aeronautical laboratory have been the principal subjects of interest in the development of aviation in the navy during the past fiscal year, according to the annual report of the Chief of the Bureau of Navigation. The success of the flying boat is now practically assured, while a broad scheme of coöperation is in effect, whereby all institutions in the country, public and private, are enabled to work together in harmony with the government laboratory and to avoid unnecessary duplication. At the end of August, 1913, 2,118 flights, aggregating a distance of about 27,097 miles, had been made from the naval camp of aviation at Annapolis, and one officer of the navy had been up 546 times. Much is expected of experiments to be conducted at Washington, where an apparatus has been installed for determining the best scientific and practical method of control of aircraft, these activities being simply a part of a comprehensive plan looking to the development of an adequate aviation service for the navy.

ELECTRIC SELF-STARTER ON FLYING BOAT

An electric self-starter has been installed on a flying boat operating at Marblehead, Mass. This innovation is in line with late practice in automobiles, which relieves the driver of the necessity of cranking up the engine, and obviates the very real danger ensuing when an engine goes dead at critical points. To the airman the idea appeals especially, because engine trouble a couple of thousand feet up in the air is an unpleasant prospect.

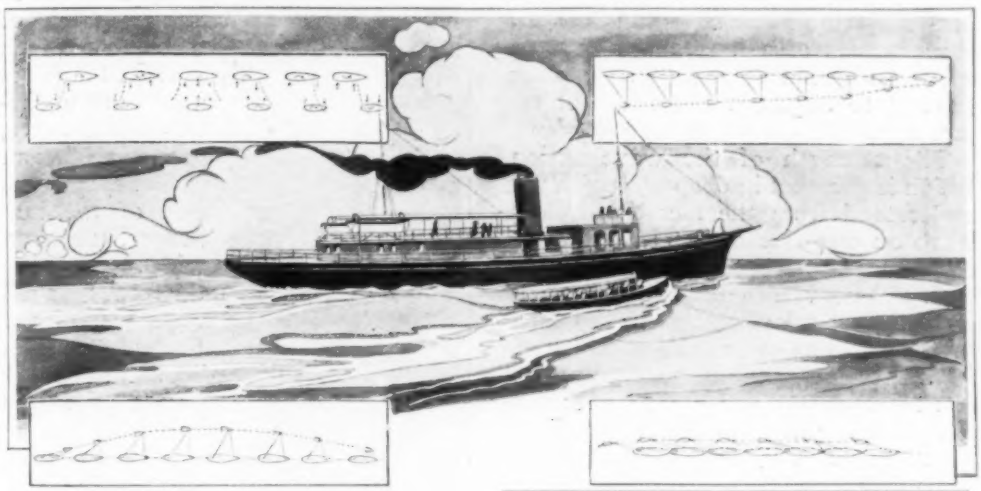


Arrow Shows Electric Starter Installed on Flying Boat

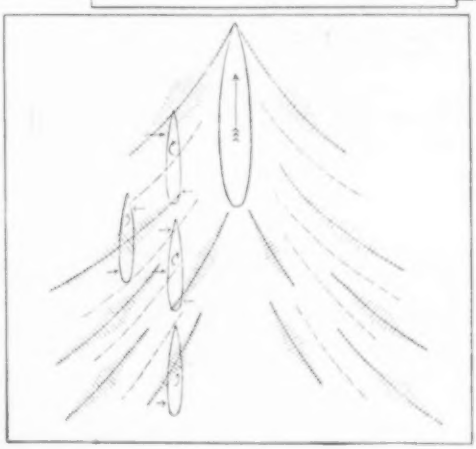
STRENGTH OF THE SUCTION BETWEEN SHIPS

The danger of collision between passing ships as a result of the "suction" or interaction between them was recently studied in a series of experiments with real vessels. Previously tests had been made with small models, but in this case a 96-ton steam yacht and a 2.6-ton gasoline launch were used. The yacht was 88.5 ft. long, with a beam of 13 ft. and a draft of 5.66 ft., and the launch was 29.33 ft. long, with a beam of 6.75 ft. and draft of 1.37 ft. In one set of experiments, the vessels were propelled past each other in parallel courses at various relative speeds with their helms lashed, so that the change in their courses caused by suction could be noted. At the same time, the strength of the suction was measured by pressure boxes set in the launch's sides. In later tests, the rudders were used as the vessels passed each other and the helm angle necessary to keep the launch in a straight course was noted.

Both methods confirmed the theory that there is a general circulatory motion in the water about a moving vessel which has certain definite effects on other vessels. Ahead of the bows there extends a fan-shaped region of increased pressure. Back of this, amidships of the vessel, the water flows inward and backward and there is a region of reduced pressure. At the stern there is another region of increased pressure which is augmented by the propeller. The effect of this pressure is illustrated by the attempt of the launch to draw past while the yacht was moving in the same direction. As it entered the pressure region behind the yacht, it tended to sheer off because of outward pressure on one side of the bow. Farther ahead, the outward pressure on the stern and the inward pres-



The Suction between Passing Ships Which Causes Them to Collide: Forces Exerted on a Launch Passing a Yacht Traveling in the Same Direction



Effect on a Smaller Boat When a Larger Vessel Draws Past It

sure on the bow caused it to sheer in toward the yacht. Directly amidships it tended to drift bodily against the yacht's side. If it succeeded in passing without collision, the outward pressure beside the yacht's bow caused it to sheer off at first and then to drift bodily away. At the same time, the bow and stern waves of a large boat have an effect on a small boat which tends in general to augment the effect of the pressure.

The strength of the wave action, which is greatest in deep water, can be understood from the fact that a 1-in. wave on one side of the bow and another on the opposite side of the stern of a 360-ft. vessel, drawing 20 ft. of water, exert a leverage action of 1,500 foot-tons. The same suction which affects the small boat in passing is also felt to some extent by the larger vessel. But the action indicated in these experiments is, of course, modified by the relative sizes and speeds of the vessels, and the distance between them. There is usually less danger when they are both traveling at high speed, especially if there is a great difference between their speeds, but if a larger vessel tries to draw past a smaller boat the danger of collision is very great. While the suction is diminished as the distance between the boats is increased, it was found to be in effect if the launch came as near the yacht as three and one-half times its own length. These were deep-water tests. In shallow water the suction is stronger.

HUB REGISTERS THE MILES IN NEW DEVICE

An attachment called the hub odometer is the latest thing in distance-recording devices. Situated in the right hub of a motor-driven vehicle it is an out-of-the-way contrivance, extending but an inch beyond the end of the hub proper. It has a width of 2 in., is dustproof and registers from 1 to 99,999 miles. The main portion of the face is white-enameled, while the narrow section in which the numbers appear is brass. Its operation is simple, consisting of a set of two gears. One of these is located on the spindle and is stationary, while the other is on the hub, which turns. Each time these gears meet they turn and register on the face of the instrument, as shown in the picture.

MOVING PICTURES FOR THE CHINESE

The Far East has indorsed the "movies," and there are already successful motion-picture establishments in Hongkong, Shanghai, and other open ports of China. The films, however, are foreign films with no adaptation to Chinese manners, language, or customs. Hongkong, by reason of its central location, has come to be an exchange center of film distribution, the films being rented or exchanged as in this country. American films with Chinese adaptation having descriptive matter and other features in the Chinese language are now being imported, as the machines made here are standard in oriental countries. Films and supplies are being sent from Hongkong to cities all over that part of the world, notably in the Philippines, Indo-China and the Malay States, Burmah, Siam, and to North China.

WHERE HUNTERS STILL USE THE LONG BOW

Bows and arrows are still in use in some parts of the world. Even now there are a few tribes of savage Veddahs, running wild in the jungles of the southeastern part of the Island of Ceylon, who make their living by snaring birds, catching fish, and shooting small animals with bows and iron-headed arrows. They are the descendants of the aboriginal inhabitants of the island and number less than 4,000 persons, representing a little over .1 per cent of the population of Ceylon. But, although they dwell in caves or bark huts and lead the wildest kind of savage lives, they are shy, simple folk, and anything but dangerous. In stature, they are slight, seldom more than 5 ft. tall, and have extremely small heads. There are few, if any, other savage tribes that do not now use firearms.

SIMPLE DEVICE PREVENTS MINE-SHAFT ACCIDENTS

The distressing accidents occasioned by the breaking of the rope used in raising and lowering cages in the shafts of coal mines may be eliminated if the device recently patented in England fulfills its mission. Two extra chains coming from the base of the rope are run down the sides of the cage and are fastened to four strong pieces of wood at its bottom. When, as in ordinary use, the weight of the cage comes upon these chains, these movable wooden pieces are pressed in beneath the bottom of the cage, but should the rope break and the tension on the chains thus be removed, strong springs project these pieces outward, where they at once engage the wooden supports at the side of the shaft, quickly stopping the cage and holding it securely until repairs are made.

¶With its recent adoption by England, the metric, or 200-milligram carat, is now the standard measure for jewels in all the important countries in the world.

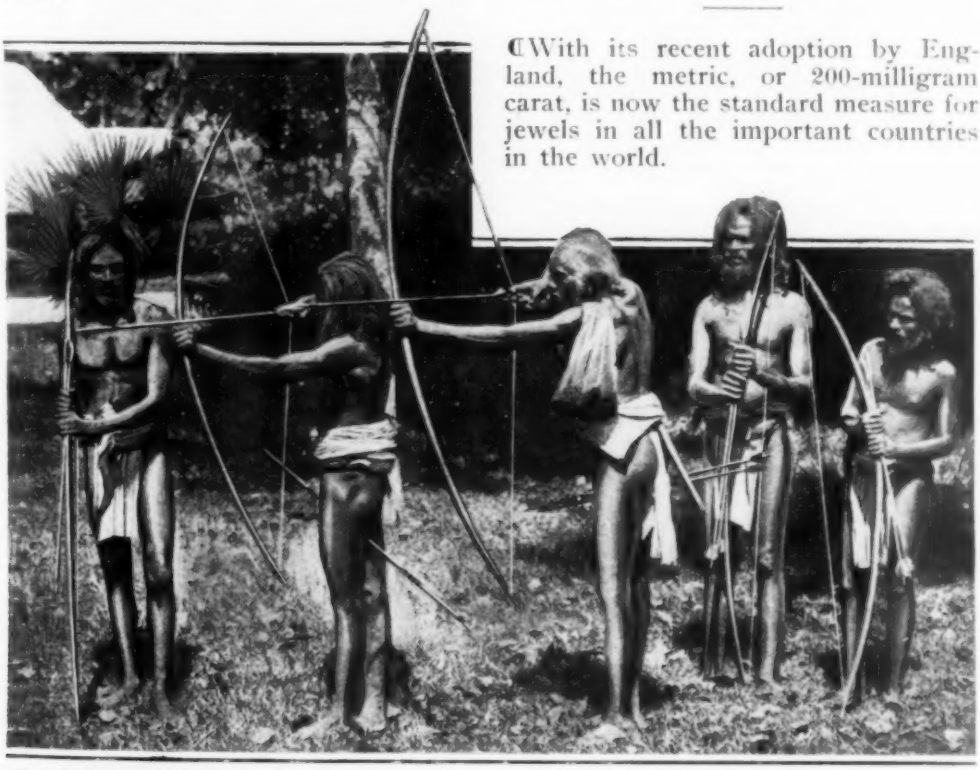
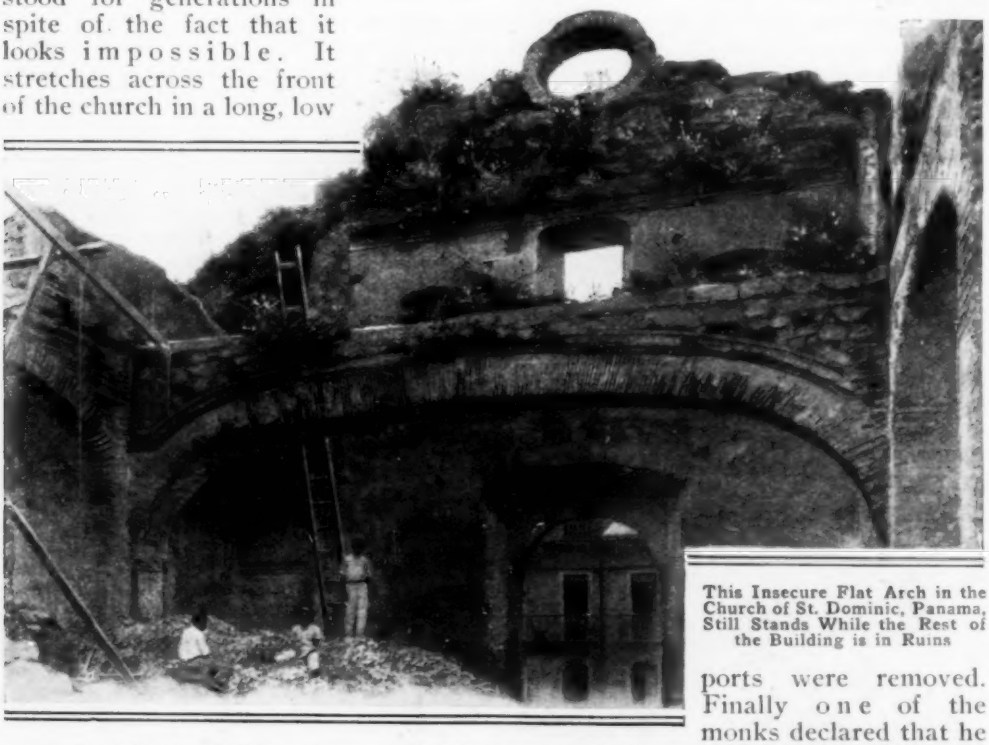


Photo by Underwood & Underwood

Aboriginal Savages of Ceylon Who Still Use the Bow and Arrow in Their Hunting

CURIOUS FLAT BRICK ARCH IN PANAMA

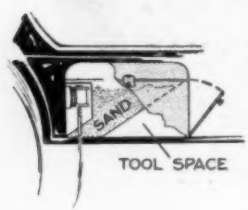
In the ruins of the Church of St. Dominic in the old city of Panama, there is a curious flat arch which has stood for generations in spite of the fact that it looks impossible. It stretches across the front of the church in a long, low span, just back of the entrance and is made entirely of brick. No architect would attempt to build such an arch today, and, according to the legend, the monks who built the church had great difficulty in erecting it. Three times the arch fell as soon as the supports were removed. Finally one of the monks declared that he was told in a dream how to build an arch that would stand and he was allowed to experiment. The arch which he constructed is still standing.



This Insecure Flat Arch in the Church of St. Dominic, Panama, Still Stands While the Rest of the Building is in Ruins

SAND-BOX EQUIPMENT FOR AUTOMOBILES

Sand boxes are the latest devices brought out to keep automobiles from slipping and skidding on slippery city pavements. The outfit, as it has appeared on the market, consists of two boxes, about the size of tool boxes, to be carried on the running-boards just ahead of the rear wheels. The flow of sand is regulated by electromagnets which raise plungers and open the sand outlets when the driver presses a button. Enough sand to last a season can be carried in the boxes, and space for tools is provided below the sand bin.



¶ Powerful motor vehicles are coming into common use in Australia to serve as feeders to the railroads in freight transportation. The most suitable type appears to be kerosene tractors with large wheels and wide tires.

NEW METHOD TO CHEAPEN COST OF RADIUM

By treating low-grade radium ores with strong alkali solution, a German scientist converts the silica into a soluble compound, subsequent flushing with water removing the large bulk of waste. The residue, containing barium and radium chlorides, is concentrated by the usual processes, and the pure radium chloride separated without delay. This treatment permits using ores heretofore neglected.

NEW PULLEY HAS NOVEL FEATURES

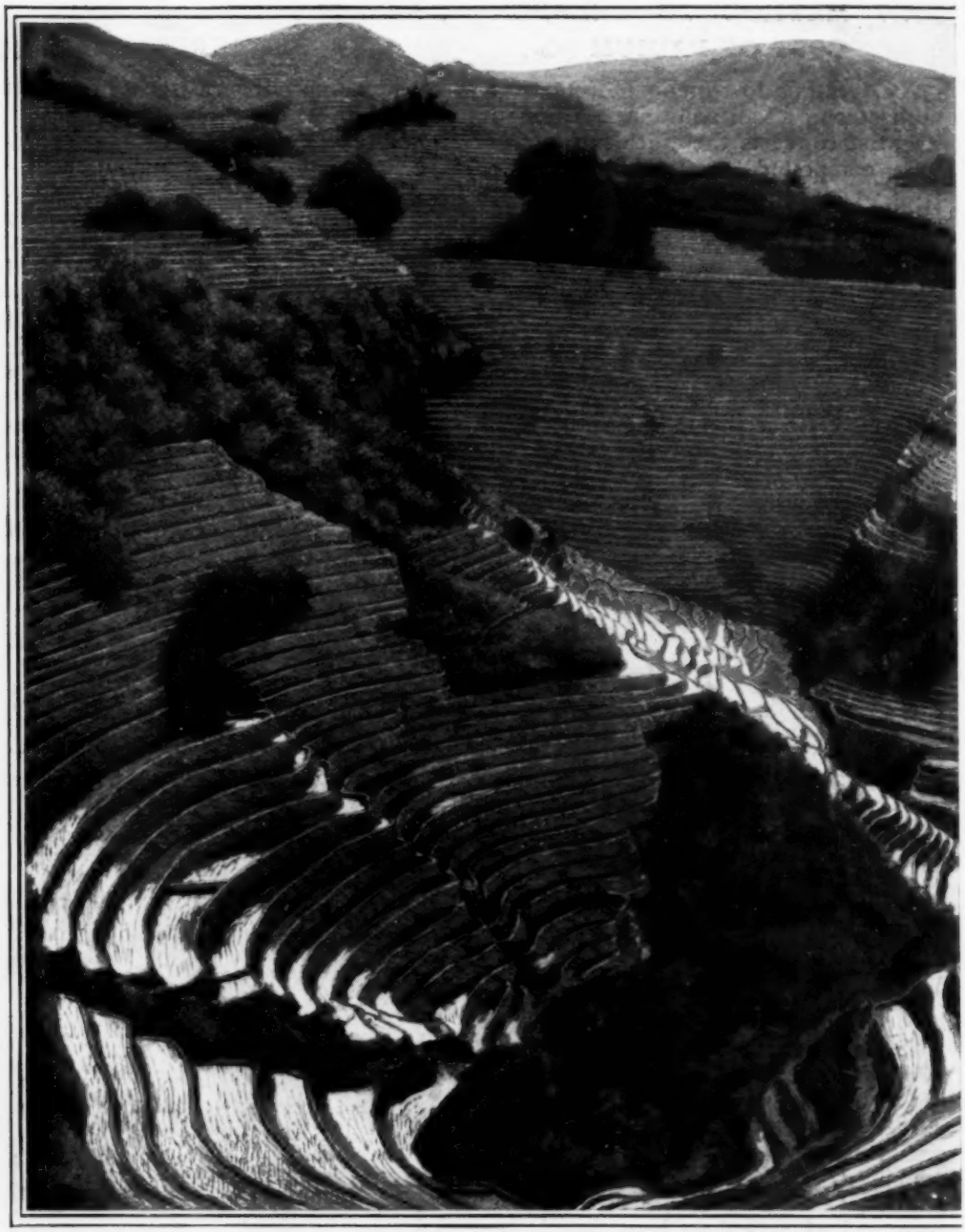
A new type of cast-iron pulley has recently been introduced which is designed particularly to overcome the effects of shrinkage in casting. The arms are odd in number and are attached to the hub tangentially instead of radially, as is the common practice, so that considerable shrinkage can occur without breaking the casting. The rim is of light section, but is strengthened by a web placed between the arms. The pulley is said to be both light and strong.

AIR-PROPELLED ICE BOAT NEWEST MOTOR VEHICLE

Although ice yachts have been sailed for years and amazing speeds have been attained, a Chicago inventor has constructed an ice boat equipped with gasoline motor and aerial propeller. Mounted on three steel blades, the chassis carries seats for three, and a 12-hp. motor drives a 4-ft. propeller similar to that used on an aeroplane, which makes 3,200 revolutions per minute. With three passengers a speed of 80 miles an hour has been made. European engineers have established the fact that the same power applied to an aerial propeller gives greater results than when applied to water propellers, and American practice seems to bear out fully their findings in this respect.

Air-Propelled Ice Boat: Close View of Motor and Aerial Propeller Below

HOW IGORROTES TERRACE STEEP MOUNTAIN



Courtesy L'Illustration

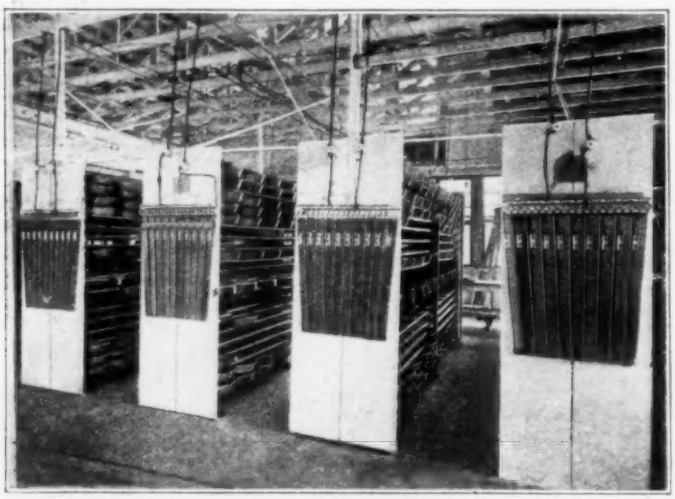
A mountain side terraced from top to bottom and having the appearance of an enormous amphitheater is one of the curious things to be seen back in the mountains of Luzon, in the Philippine Islands. This section of the island is inhabited by Bontoc Igorrotes, a tribe of savages who have resisted all attempts at civilization, but who, owing to necessity and in spite of primitive tools and methods, have become skilled agriculturists.

SIDES AND CONVERT THEM INTO RICE FIELDS

Having practically no farm lands available but steep mountain sides, the Igorrotes have made these suitable for rice culture by elaborate systems of terracing. The terraces are connected by irrigation ditches taking water from points high up in the mountains, and in this way a regular water supply is assured, without which rice farming is impossible, since the grain requires the literal flooding of the land while the young plants are growing.

ELECTRIC HEATERS USED IN PRESERVING FRUIT

A California concern cooks preserves, marmalades and jellies on a large scale by the use of electric heaters. The kitchen is arranged with broad, low shelves on which shallow pans are placed, the heating units so spaced as to serve as rests for the pans. Placing the ripe fruit in these pans and regulating the heat gives slow cooking, bringing out full flavor values and avoiding overheating and discoloration.



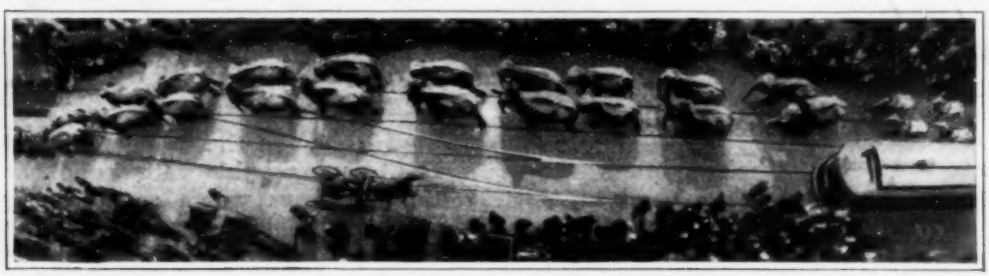
Electric Kitchen Where Fruit is Cooked in a Way Which Preserves the Flavor

MACHINE ON NOVA SCOTIAN COAST COUNTS WAVES

A complete record of the waves which beat upon the shores of Nova Scotia is now being made by means of a machine recently invented and which is called the "Undagraph." An iron pipe, 625 ft. long, is led into the sea to a depth of 15 ft. below the trough of the wave at low tide. The sea end of the pipe is left open, the other end opening into a box, in one side of which a leather diaphragm is fastened. The passage of the waves over the sea end of the pipe causes the water to rise in the pipe and compress the air in the box at the shore end, whereby the leather diaphragm is moved and electric contact made. A toothed wheel is pushed forward by means of the armature of an electromagnet, one tooth for every wave, actuating a recording pen on a paper-covered cylinder. The record is a finely serrated or saw-edged line, showing the number of waves per minute, hour and day.

LOOKING DOWN ON THE ELEPHANTS

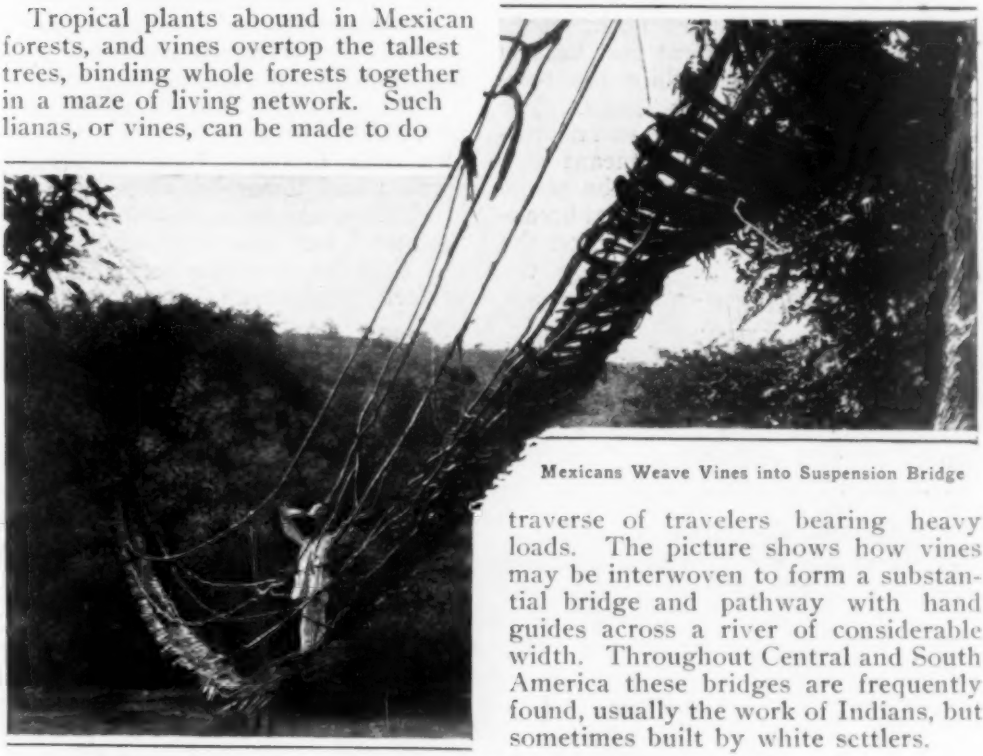
It is very rare that a photographer has an opportunity to "catch" 20 elephants at one shot. And rarer still when the herd files beneath him in as orderly a manner as shown in the picture. An airman crossing Africa might have such an opportunity, but here in America an amateur photographer located on the fifth floor of an office building secured the unusual view shown herewith.



A Herd of Elephants Seen from Above

VINE BRIDGE ACROSS MEXICAN RIVER

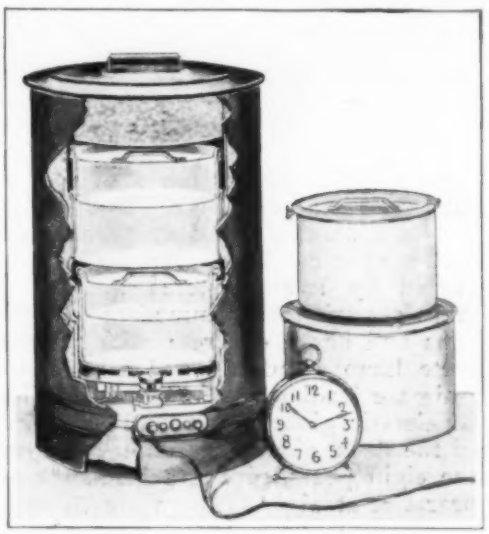
Tropical plants abound in Mexican forests, and vines overtop the tallest trees, binding whole forests together in a maze of living network. Such lianas, or vines, can be made to do duty as suspension bridges, their tenacity being great enough to permit the traverse of travelers bearing heavy loads. The picture shows how vines may be interwoven to form a substantial bridge and pathway with hand guides across a river of considerable width. Throughout Central and South America these bridges are frequently found, usually the work of Indians, but sometimes built by white settlers.



Mexicans Weave Vines into Suspension Bridge

NEW AUTOMATIC ELECTRIC COOKER

An electric cooking device, automatic in its temperature control, is shown in the accompanying picture, which combines an active electric heating unit with inclosed and thoroughly insulated cooking space. A metal container, with tightly fitting lid and apertures for the entrance of electric wires, incloses another metallic container, the space between being carefully insulated. The heating units are attached to the bottom of a double-walled steam chamber. Here a small quantity of water is boiled and partly changed to steam, which fills the space between the walls of the steam chamber, heating all portions evenly. The bottom of the steam chamber is sprung, like the bottom of an oil can, and when the pressure of the steam is sufficient to overcome the spring it snaps downward, operating a pin which forces

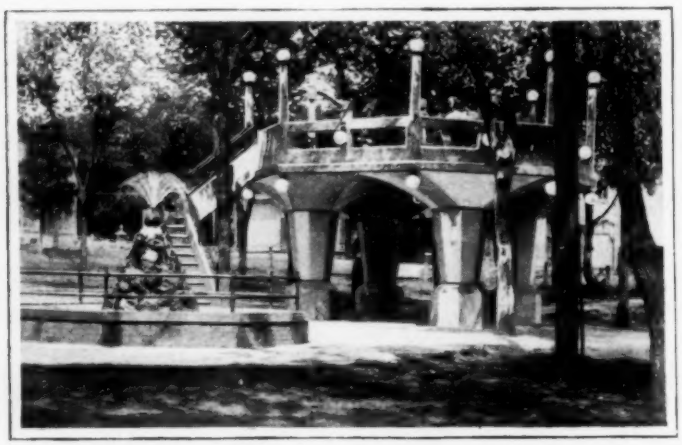


Electric Cooker with Time Switch

open the switch contacts, cutting off the electric current. When the walls slightly cool the pressure is reduced and the bottom snaps back, again switching on the current and heat is again produced controlling the temperature within narrow limits. The cooker may be connected to an ordinary lamp socket, and by means of a time switch the cooker may be set to start at any hour desired, so that breakfast, prepared and set in the cooker the night before, will be ready in the morning.

CONCRETE BAND STAND BUILT IN A DAY

Only one day's labor by volunteer workmen was required to build the ornamental band stand, of massive concrete construction, which stands in a park in Humboldt, Neb. In form it is like a huge table standing on four heavy concrete legs. Its deck, supported by low cloistered arches, is large enough to accommodate 40 persons and has a concrete railing, concrete lamp standards, and a concrete staircase leading to the ground. The 25 electric globes set round the edge of the deck, along the railing, and on the eight posts, give it a brilliant appearance at night. There are 75 tons of concrete and two tons of steel-rod reinforcement in the structure.



Ornamental Concrete Band Stand Built in One Day by Volunteer Workmen

ALUMINUM UTENSILS SAFE FOR COOKING

Experiments conducted by a Scotch scientist to ascertain if aluminum cooking utensils were in any way affected by the food prepared in them, have proved that no injurious results were obtained. Oranges, lemons, Brussels sprouts and tomatoes, when prepared in aluminum utensils, dissolve some of the metal, but in so very small quantities that the resulting formations are perfectly harmless.

GREAT ASSUAN DAM PROVES EFFECTIVE

Egypt has already received the benefits of the increased capacity of the great Assuan dam in the Nile, because the river above the dam was lower last year than it had been for 50 years. At Halfa, 200 miles above the dam, the Nile fell 5 ft. below the average of the last 13 years, which meant a flow of 650 tons of water a second instead of the usual 1,500 tons at that time of the year. The rains in Abyssinia and the annual flood of the Blue Nile and Atbara Rivers were a month late, but there remained as much water stored in the reservoir as there was 36 days earlier the year before the dam was enlarged. The recent improvements have increased the storage capacity of the Assuan reservoir from 800,000 to 2,000,000 acre-feet. The cycle of operation is as follows: In November, when the Nile is falling, the closing of the sluice gates begins and, by January, the water in the reservoir has reached its top mark, 70 ft. Toward the end of March the reservoir begins to help the lower river and continues to empty gradually until the July floods arrive. From July to November, the gates are wide open

and the silt-laden water is allowed to pass through freely. Much study of rainfall conditions is necessary for a proper regulation of the sluices.

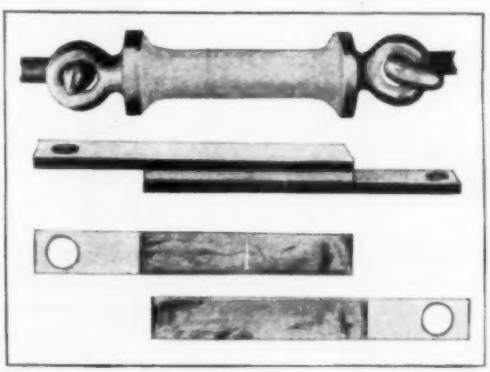
CARRIAGE OVER 200 YEARS OLD STILL IN USE

Imported from France two and a quarter centuries ago, and now in use on the streets of Petersham, Mass., a carriage which may have been considered the last word in fashionable equipage during the reign of Louis XIV, is now a unique spectacle. The upholstering was made upon a hand loom from wool and linen; the curtains, too, were made of linen, and painted. The top is of very thin wood, covered with linen canvas and painted. The axles are of wood, the hubs turned by hand and the spokes were hand-made with a drawing knife. Linchpins fasten the wheels. The body is swung upon thorough-braces of leather. Tires, axles, bolts, and even the little tacks used to fasten the upholstering were hand-made, the product of the old-time blacksmith. This veritable old "One-Hoss Shay" has been in the possession of various Petersham families for generations and is still used behind "Old Dobbin," while shining limousines whirl past at high speed, disdainful of this product of the time of "The Grand Monarch."

Copyrighted by J. W. Baldwin
Oldest One-Horse Carriage in America

RUBBER CLINGS TO STEEL IN NEW PROCESS

Rubber may be firmly attached to steel by a new process in which the rubber is vulcanized directly to the metal. Two tests are shown, in one of which the rubber appears between two flat pieces of steel, considerable force being required to wrench them apart, the rubber adhering to both surfaces. In the other, the rubber was vulcanized to two steel disks and when tension was applied the rubber stretched to two and a half times its normal length without parting. This problem has been studied for years and heretofore has eluded solution. Its application is obvious in the electrical industry.



Steel Disks Vulcanized to Round Piece of Rubber—Rubber Vulcanized between Steel—Steel Pieces Torn Apart, Rubber Adhering to the Steel

¶ Separate compartments, or stalls, for each toe is the latest Parisian style for stockings. It is said these prevent those corns which are caused by the rubbing of the skin against the next toe.

RESIDENCE WRECKED BY FALLING TREE

An unusual accident occurred recently in a New Jersey town when a huge tree which was being removed by a contractor from a vacant lot fell upon a near-by house, almost demolishing it. The ground about the tree had been dug, the tree guyed and stayed, and a block and tackle rigged to pull the tree in the desired direction when, just as the contractor gave the word and the horses threw themselves forward, a heavy gust of wind from an opposite direction blew the tree against a neighbor's residence. The horses were pulled over backward, the upper floors and porch of the house were wrecked, and the housewife and a child were buried in the ruins, from which they were shortly rescued by workmen.

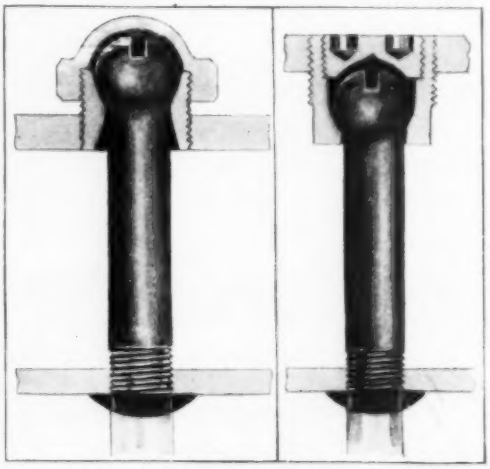
House Wrecked in Peculiar Manner

PUBLIC CALL STATIONS FOR TAXICABS

Automatic machines, which look like letter boxes, have been placed at every cab stand in Hamburg, Germany. Anyone who desires to call a motor car and finds none at the stand, may insert a coin in the machine, whereupon a signal is flashed at the central station. The central station is at all times advised of the location of waiting motors throughout the city and immediately sends a car to the waiting customer. The coin which has been dropped in the machine is credited toward the payment of the fare. The system is extended to residences as well.

BALL-AND-SOCKET JOINT USED IN STAY BOLT

An English inventor has designed a flexible stay bolt, in which the spherical head and the similarly shaped recess for it in the sleeve and cap provide a ball-and-socket joint, permitting the bolt to adapt itself to various strains without shearing. The bolt is made in two types, with outside head and with inside head, so that it can be used in a large number of positions.



THERMOMETER IN RAILROAD OPERATION

Temperature affects the performance of locomotives, the loading and unloading of trains and the movement of freight. It is thus important to know just how hot or how cold it is at any given place on the line. An eastern railway line has placed thermometers at frequent intervals along its lines and keeps a careful record of changes in temperature. The thermometers are inclosed in wooden boxes carefully painted, and are not affected by drafts and reflections.

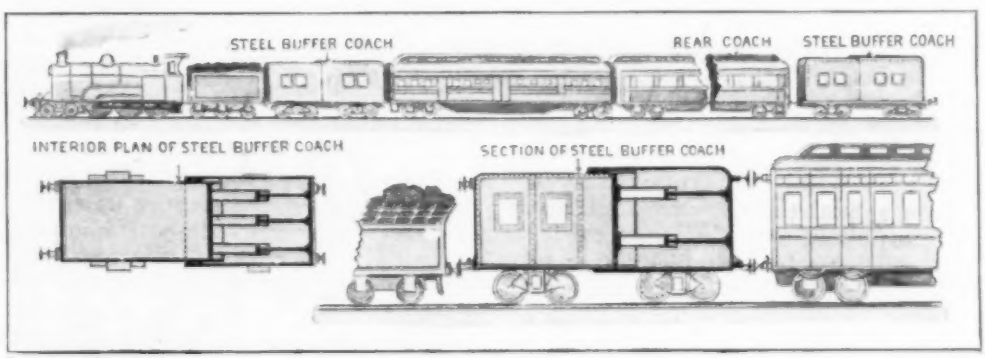
¶It is estimated that the export of moving-picture films, counting both developed films and negatives, from the United States for the year 1913 amounted to over 25,000 miles. For the nine months ended with September the value of these exports was $3,467,000.

SUBSTITUTE FOR CEMENT USED IN TURKEY

Slaked lime, thoroughly incorporated with linseed oil and cotton fiber, is used in Turkey as a substitute for cement in some instances with good results. The mixture is as satisfactory under water as in exposed places, but must be allowed to dry thoroughly before submergence. A hollowed-out stone is used as a mixer, the oil being first poured and cotton fiber kneaded in, while lime is dusted in as the process continues.

SAFETY SOUGHT THROUGH COLLISION CARRIAGES

For the transition period between wood and steel trains an English inventor suggests the use of buffer coaches whose function it will be to take up the first blow of the collision. These special cars, as may be noted from the pictures, will be so arranged that they telescope into themselves against heavy springs. They may be built heavy enough to resist the usual crumpling up and at the same time have enough resiliency to dissipate the striking blow. One of these buffer coaches at each end of the train would absorb so much of the energy of a collision that the passenger coaches would escape destruction. Such, at least, is the contention of the inventor, who insists that the day of the all-steel train must be delayed until the wooden cars can be replaced with economy.

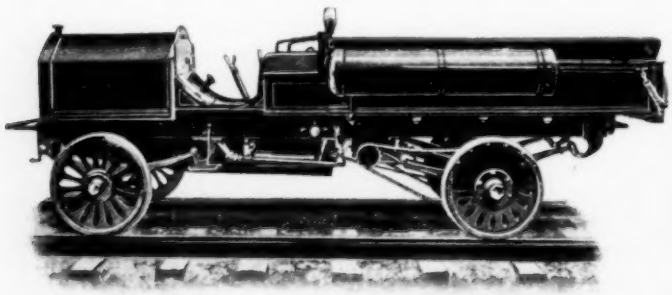


Courtesy of The Sphere

Suggested Device for Minimizing Collisions

RAILROAD INSPECTION CAR USES GASOLINE POWER

A new railway-inspection car, for use of contractors and railway officials, is of two-ton capacity, with a wheel base of 108 in., and is capable of reaching a speed of 25 miles an hour. There is a drawbar hitch at either end, and the car runs equally well forward or reverse. The entire mechanism is mounted on springs. The wheels are 26 in. in diameter, of standard flange type, and surplus fuel is carried in the tank at the side, for long hauls. A trailer may be attached when desired.



Speedy Little Motor Car for Railway Work

FRENCH USE AEROPLANE IN POSTAL SERVICE

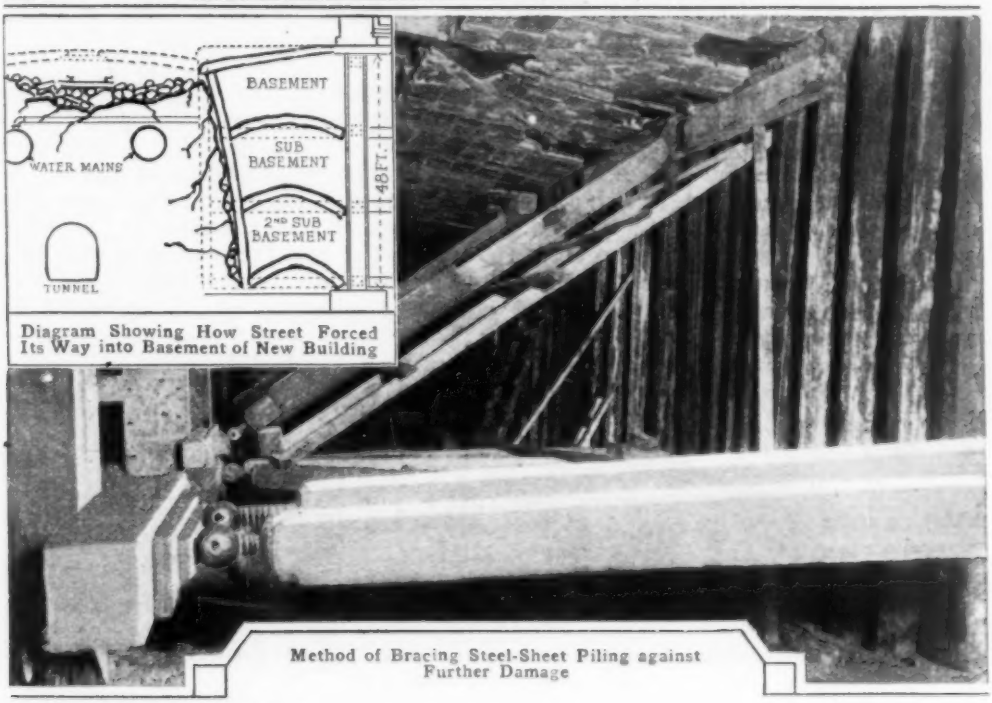
The success of the first experiment in France of an aerial post which resulted in a saving of 24 hours in dispatching transatlantic mail, has so pleased the minister of commerce that it has been decided to continue and extend the service. It is proposed to send an aerial messenger to Nice, stopping at Lyon and at Marseilles. Leaving Paris in the morning he is expected to reach Nice in 12 or 14 hours. With favoring winds it is hoped to deliver newspapers from Paris in the evening instead of in the morning, as at present. This service will also shorten the time for the evening mail from London, as letters sent from that point at night, and reaching Paris the next morning, would be delivered at Nice the same evening. The added tax on letters will be about four cents.

SECTION OF BUSY CHICAGO STREET COLLAPSES

An accident of an unusual nature occurred in Chicago recently when a section of one of the busiest streets in the loop district of that city suddenly crumbled and sank to a depth of about 8 ft. below street level. This collapse, which extended from curb to curb and along the street for half a block, is attributed to the failure of a wall of steel-sheet piling driven along the south side of the street to keep the earth out of the deep excavation made for a new skyscraper then under construction. The area covered by the building had been excavated to a depth of about 48 ft. below street level to allow for a basement and two subbasements. Owing to some weakness in the sheet piling or to some increase in pressure not anticipated by the builders, the steel-sheet piling was bent inward by the load and a large amount of the material under the street "flowed" into the excavation, causing a corresponding sinking of the street surface. The force of the movement was such as to seriously damage the steel frame of the new building. A contributory cause of the cave-in may have been the weight of the Masonic Temple, half a block away, which, like many of the earlier Chicago skyscrapers, rests on the old-style "floating" foundation, and which may have caused considerable pressure to bear against the slender steel wall. The accident occurred about midnight, at a time when the street was comparatively deserted, and no one was injured. The damage to the street, building and underground conduits is estimated at about $100,000.

Repairing the Street and Car Tracks after the Collapse

Diagram Showing How Street Forced Its Way into Basement of New Building

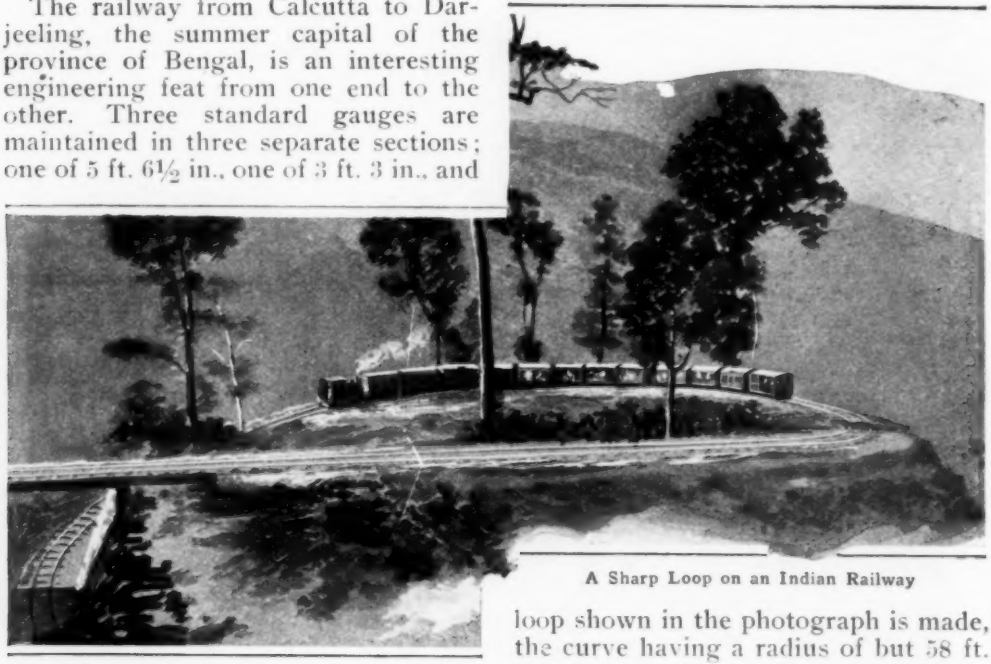


Method of Bracing Steel-Sheet Piling against Further Damage

Photo by International News Service

SHORT CURVE ON RAILROAD IN THE HIMALAYAS

The railway from Calcutta to Darjeeling, the summer capital of the province of Bengal, is an interesting engineering feat from one end to the other. Three standard gauges are maintained in three separate sections; one of 5 ft. 6½ in., one of 3 ft. 3 in., and on the 51 miles from Siliguri to Darjeeling, one of but 2 ft. It is on this latter section that the extremely sharp loop shown in the photograph is made, the curve having a radius of but 58 ft.



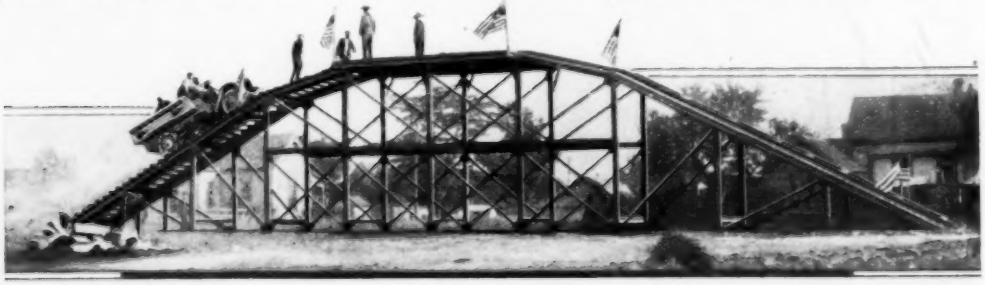
A Sharp Loop on an Indian Railway

A STEEL STAIRCASE FOR TESTING MOTOR CARS

A device designed to test motor cars consists of a steel structure with a 50-per-cent grade, 100 ft. long, built like a staircase at one end for ascent, and cleated at the other end, by which the cars descend. The general appearance of the structure suggests a bridge, or viaduct, and presents such difficulties that a car which could negotiate it successfully need little fear any hazard presented by a cross-country run.

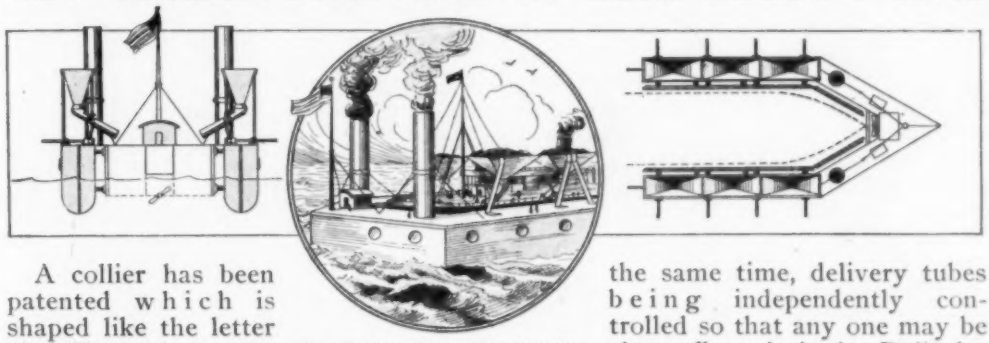
FILM SEIZED AS EVIDENCE OF STRIKE BATTLE

A motion-picture film, depicting an actual battle between mine guards and strikers at Ludlow, Colo., has been confiscated by the adjutant general of that state. The motion-picture operator was in such position that his camera caught the faces of men engaged in the battle on each side. The film may be enlarged and is expected to show the faces of the men engaged so that they can be identified.



Bridge for Testing Motor Cars

NEW COLLIER LOADS SHIP ON BOTH SIDES AT ONCE

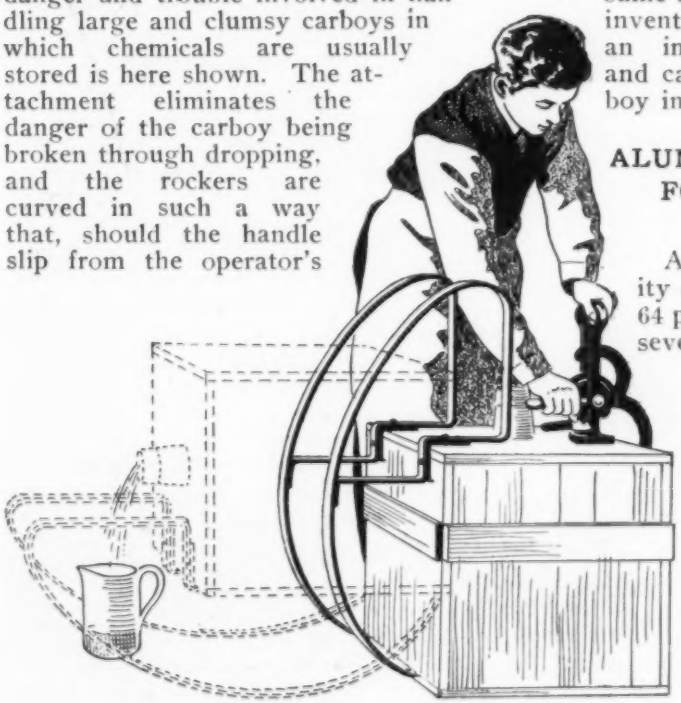


New Collier Coals Ship Quickly by Surrounding It

A collier has been patented which is shaped like the letter U. The ship to be coaled enters the open end, is held by adjustable buffers and clamps, and the bunkers are filled by gravity from coal pockets in the collier. This enables the coaling to be done in short time, as one or more bunkers on either side may be filled at the same time, delivery tubes being independently controlled so that any one may be shut off as desired. Built for the largest-size ships, the collier will also accommodate smaller vessels by means of the adjustable buffers and clamping strips, which hold the ship steadfast. The motive and operating power of the collier is contained in the bow portion.

DANGER-LESSENING DEVICE FOR CARBOYS

A practical device for lessening the danger and trouble involved in handling large and clumsy carboys in which chemicals are usually stored is here shown. The attachment eliminates the danger of the carboy being broken through dropping, and the rockers are curved in such a way that, should the handle slip from the operator's hands at any time, the carboy will assume an upright position. The invention, which is known as an inclinator, is adjustable and can be attached to a carboy in less than a minute.



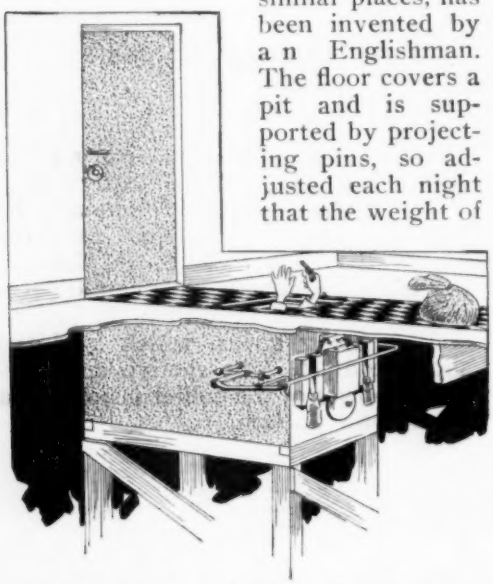
Device for Handling Heavy Carboys with Ease

ALUMINUM-WIRE COILS FOR ELECTRICAL APPARATUS

Although the conductivity of aluminum wire is but 64 per cent of that of copper, several experiments have recently been made with it as winding for various types of electrical apparatus. The coils made of it have to be increased in size, and this results, of course, in a considerable increase in bulk, but the weight being in favor of the aluminum, an aluminum coil weighs a little less than half as much as a copper coil.

UNIQUE TRAP FOR BURGLARS

A burglar trap, consisting of a false floor constructed in front of the office safe, a counter in a jewelry store, or similar places, has been invented by an Englishman. The floor covers a pit and is supported by projecting pins, so adjusted each night that the weight of

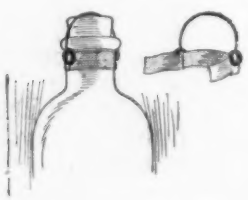


A Novel Floor Trap for Catching Safe Blowers or Store Thieves

a person upon the floor will cause it to fall, dropping the intruder into the pit, where he alights upon springs or pneumatic shock absorbers, provided so that he may not be injured. The dropping of the floor operates a lever which causes a sliding door to close over the mouth of the pit.

SAFEGUARD FOR POISON BOTTLES

A very simple device for conveying a warning that a bottle contains poisonous substances has been patented. It consists of a gummed band carrying a wire loop, the ends of which, terminating in spring coils, are firmly fastened in the texture of the band. The wire loop is normally held over the top of the cork, but may be pulled back with the forefinger when the cork is to be removed, and springs back to upright position. It is obvious that the cork cannot be removed without indicating the nature of the contents of the bottle. The device is applied by simply moistening the gummed side of the band and sticking it around the neck of the bottle.



EFFECT OF ELECTRICITY ON HUMAN BODY

Late investigations into the effect of electric currents on the human body indicate that direct currents contract the vessels and increase blood pressure, while alternating currents dilate the vessels and the blood pressure is consequently reduced. Currents with voltages over 200 are dangerous and those over 500 usually fatal. The resistance between two points in the human body varies largely, from 16,000 to 80,000 ohms being observed. The skin alone is responsible for the far larger part of this resistance, or from 15,000 to 79,000 ohms. The intensity of the current passing through the human body is, of course, dependent upon the amount and form of contact, and whether the skin be moist or dry. In the former case the skin resistance is practically eliminated. When the frequency of an alternating current reaches 150 periods a second the heart action stops immediately. The fluids of the body expand, exerting pressure on the nerve centers in some cases, and in an accident of this kind the head of the shocked person should be raised, as otherwise the pressure on the brain would further increase. The heat generated in the body by the passage of the current is not inconsiderable, after-death temperatures of 104 deg. F. and more having been observed.

¶Honey put up in collapsible tubes, like artists' colors or tooth paste, is the latest novelty on the German market.

GRADE FLATTENED TO HELP DOWNHILL TRAINS

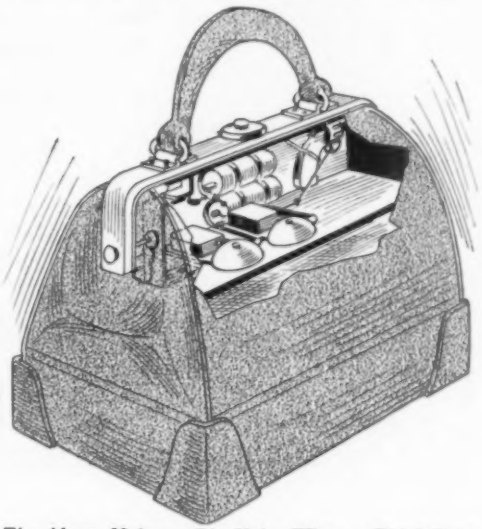
A double-track railroad line down the west slope of the Wasatch Mountains in Utah has been rebuilt on a new location and the grade reduced from 211 ft. to 105½ ft. to the mile, not to help uphill traffic, as is usually the case in such improvements, but to make the operation of trains down the hill safer and more practical. By far the heaviest movement of freight in this section is westward. Although the pulling of trains up the hill has always been a serious proposition, letting heavy freight trains down the hill safely has been, owing to the limit in capacity of air-brake equipment, a big and uncertain job. To minimize the danger of runaway trains, three safety switches, designed to take trains from the main track and turn them on an upgrade along the side of the mountain, have been maintained on the old line. These were always set to switch a train off the main line, and in approaching these switches the engineer was required to give a whistle signal indicating that he had his train under control before the switch could be thrown and the train allowed to proceed down the main line. In addition to this precaution, the air brakes were always adjusted before a train left the summit so that they could not be entirely released, but would exert a pressure on the wheels at all times. The necessity for these precautions has been done away with by the construction of the new line, which is 4½ miles longer than the old and much more crooked, and is laid on a grade only half as steep.

NEW TYPE OF RAILROAD REFRIGERATOR CAR

A refrigerator car that can be cooled in summer, heated in winter, or simply ventilated during the mild weather of spring or fall, without any change in apparatus or even the necessity of entering the car, is one of the latest developments in cars used for the shipment of perishable freight.

THIEF-PROOF SATCHEL FOR PAYMASTERS

A satchel with a burglar-alarm attachment is one of the latest ideas for protecting bank messengers and paymasters from thieves. Inside the satchel are bells and a revolver loaded with blank cartridges, under the control of a mechanism similar to the combination lock on a safe. As long as the satchel is in the hands of the messenger, it is quiet; but as soon as he lets go of it, the bells begin to ring and the revolver is fired. Such a thief-proof satchel, weighing 8 lb., has recently been patented.



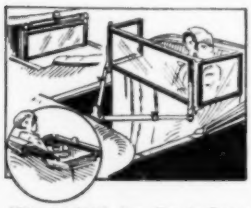
The Alarm Makes a Big Noise When a Thief Tries to Rob the Bank Messenger

PATCH FOR AUTOMOBILE TIRES

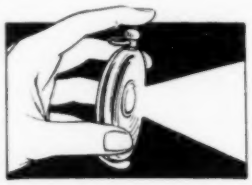
A patch designed to prevent blowouts in automobile tires, of which there is usually sufficient warning, and to keep the tire in running order until permanent repairs can be made, is shown in the illustration. This patch is made of from five to seven plies of heavy fabric and is from 10 to 12 in. in length. No cement is needed in applying it.

NOVEL AND PRACTICAL THINGS FOR DAILY USE

One of the newest things making for comfort in motoring is a windshield for protecting the occupants of the back seat. This device automatically locks itself in any position and when not in use is folded compactly against the back of the front seat. The upper part consists of a three-sided glass shield and from this is suspended a cloth shield which hangs to the floor of the car. The device can be readily converted into a table when desired.



Windshield for Back Seat of Automobile



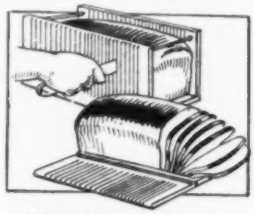
Electric Vest-Pocket Lamp Made Like a Watch

An electric vest-pocket lamp, made in the form of a watch and weighing less than 3 oz., is a novelty recently brought out in Germany. Current is supplied by a two-cell storage battery inclosed in the case, while the electric-light bulb is placed in a depression in the side of the case. The light is turned on by pressure on a push button at the top of the stem.

A holder to be attached to the wrist and designed for carrying the spool of material used in crocheting, knitting, embroidering, lace work and needle work of every kind is one of the handy little devices recently placed on the market. The spool is held securely by a light pressure of the brackets. The bracelet portion can be instantly attached to the wrist or removed, while the whole device can be adjusted to any size of wrist or spool.

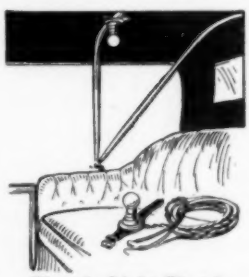
Device Holds Spool in Convenient Position for Crocheting

A bread slicer now being introduced consists simply of the old and familiar miter box applied to a new use. The loaf of bread is placed inside the box and the slots in the sides serve as guides for the knife, with the result that the slices are of uniform thickness. Two spacings are provided in each box, as shown, and the box is readily laid out flat by releasing the hooks at the top.



Miter Box for Slicing Bread

An electric light that is readily attached to the supports of the folding automobile top for lighting the interior when the top is raised is a new feature designed to add to the pleasures of night riding. The bulb is carried on a strap that is buckled around one of the supports, while the two ends of the cable are connected to an ordinary four-volt accumulator or a six-volt dry cell.



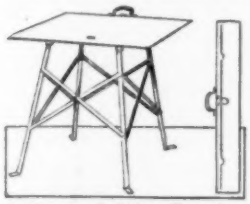
Electric Light That is Readily Strapped to Support of Folding Automobile Top

To protect the contents of a milk bottle after the paper cap has been removed is always a troublesome matter, and to overcome this a glass cap made to fit loosely into the neck of the bottle has been designed. The cap is easily cleaned, while its weight is such as to cause a tight seal for the bottle.

Glass Cap for Closing Milk Bottle after Paper Cap has been Removed

A handy device for motorists and picnic parties is a spare seat that can be folded up compactly when not in use and is provided with a handle

for convenience in carrying. The device is of constructed metal and is light but strongly built.



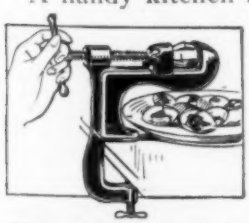
A Handy Folding Seat for Motorists and Picnic Parties

A new bottle closer brought out in France may be attached to any ordinary bottle, but is intended especially for hermetically sealing bottles that contain effervescent liquids. The cap is lined with rubber and is held in closed position by a strong spring. The cap is lifted by pressure on the lever in grasping the neck of the bottle and snaps back into place and closes the bottle the instant this pressure is released.

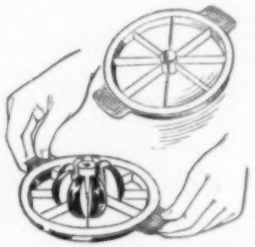
A nutcracker, now being introduced, has a movable head worked by a screw and applies all the pressure on the ends of the nut, a method that causes the shell to burst at the center without breaking the meat. In using, the handle bar is turned until the nut begins to crack, when a quick turn causes the shell to burst outward at the center. This cracker is made of malleable iron and is designed to be used with hard or soft nuts of any size. It is provided with a screw clamp by which it can be readily attached to any ordinary table.

Device for Closing Bottles That Contain Effervescent Liquids

A handy kitchen novelty is a cutter that slices an apple and cuts out the core at one operation. It is made in two forms, one for cutting the apple into eighths and the other for cutting it into twelfths, and is particularly useful in preparing apples for baking. It is provided with two handles conveniently located at the sides, and in using, the apple is simply set on end on the table and the cutter is forced down through it, cutting the fruit into equal slices. It can also be used for cutting potatoes into shape for French frying.

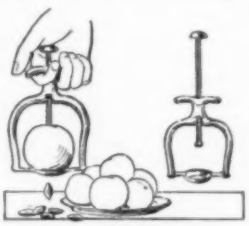


Nutcracker Bursts Shell at Center and does Not Break Meat



Cutter That Slices Apple and Cuts Out Core at One Operation

Stoning peaches by the ordinary method of cutting the fruit open is a tedious process and is often undesirable for other reasons. The device shown is provided with a rod or plunger which passes down through the peach and forces the stone out through an opening in the bottom of the holder, leaving the peach practically whole. Although designed to be held in the hand, the device can easily be attached to a table by means of a screw, where large quantities of the fruit are to be handled. The plunger is provided with a spring which forces it back into its original position as soon as released.



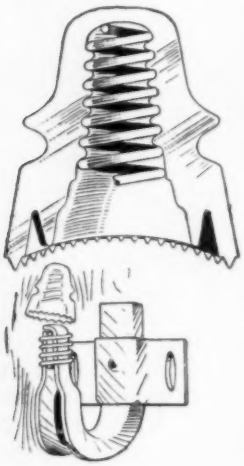
By Forcing Plunger through the Fruit the Peach Stone is Pushed Out

A spoon or ladle with an extension handle is a recently invented implement designed for the convenience of the cook in cases where large quantities of soup or other liquids are to be prepared, and especially where varying requirements make a variety of lengths of handle desirable. The extension slides in the handle proper, and is fixed at any desired position by means of a setscrew.

Spoon with Handle That may be Varied in Length

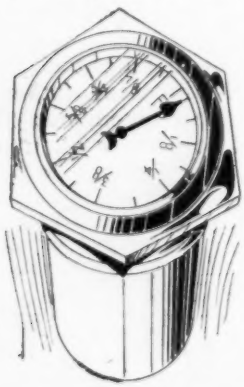
SPRING-THREAD HOLDER FOR INSULATORS

A spring thread designed to do away with the breaking of electric-wire insulators from expansion and contraction, which frequently occurs when solid threads are used, has been perfected, and is shown in the illustration. In hot weather this spring thread elongates and creeps further up into the insulator thread, thus preventing destructive pressure on the glass, while in cold weather it keeps in close contact with the glass and prevents any wobbling. It is also claimed for this device that, owing to its resiliency, it will absorb sudden jerks or strains that might otherwise break the insulator.



TANK GAUGE MEASURES LIQUID CONTENTS

A mechanical device to measure the quantity of liquid in a tank is becoming popular among motorists. The gauge is made up of a vertical tube and a horizontal dial upon which is indicated the surface height of the contained fluid.



¶Recent investigations made in England show that 25 per cent of industrial accidents could be attributed to bad lighting. Many factories were found to have plentiful light, but bad distribution.

WIRELESS MESSAGES TO GO AROUND THE WORLD

The time when the governor of the Hudson Bay Company had laid before him daily a copy of the London Times exactly one year old, seems very distant now that the wireless gives instantaneous news service the wide world over. An incident in the mining camp of Gowganda, in northern Canada, a day's ride from the farthest tip of the railway lines, is in point. A young engineer who had spent some time in amateur wireless practice in Toronto had rigged up, in that far-off mining camp, an aerial and equipped it with homemade receiving instruments. About him stood a group of rough miners, breathlessly awaiting the completion of a message. "He's talking to the 'Mauretania,'" muttered the engineer. "He says that Mathewson won today's game for the Giants." Instantly the room was filled with uproar. "Hooray!" they cried lustily. "Just you wait till tomorrow," shouted one of the engineers, "and see what Plank does to them Giants!"

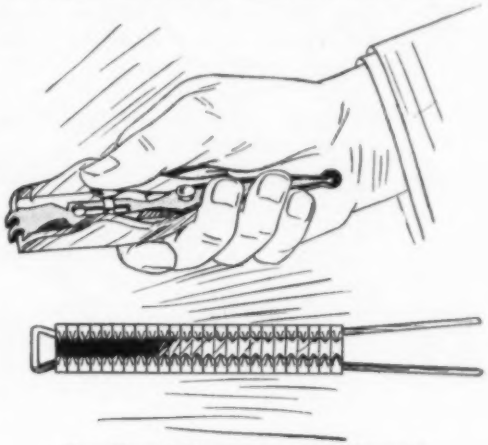
The world is now almost and soon will be completely belted with wireless. The United States is preparing to cover the western hemisphere with towers capable of communicating across the Atlantic, and, through the use of relay stations, from one side of the Pacific to the other. At the last International Wireless Congress, at which were representatives from all the civilized nations of the world, it was planned that Great Britain should erect a gigantic wireless tower on the banks of the Suez Canal and another at Calcutta; that Japan should build one at Yokohama, that Italy should construct one near Messina, and these, with the one already working from the top of the Eiffel Tower in Paris and with what this government contributes to world communication at Guam and Honolulu as well as throughout America, will be sufficient to girdle the world, and, by preconcerted arrangement, transmit messages from any part of the world almost instantly.

Plans are now under way in the Navy Department for the erection of a number of stations comparable to the huge masts at Arlington, overlooking the national capital, and their twin spires at Colon and Mare Island, with one inland station, either at St. Louis or Chicago, which will take care of all classes of messages, whether filed in the United States or relayed into our territory by other nations for communication elsewhere. The wireless towers already working have tremendous range. The station at Arlington has often caught time flashes from the Eiffel Tower, and the sending of messages across the continent and from Washington to Panama is of common occurrence. Lately a flash was caught at Arlington from the Samoan group, in the Southern Pacific.

With the placing of powerful stations on the coasts it will be possible for our government to be in touch at all times with individual units of our fleet in whatever waters they may be. Dewey's expedient at Manila Bay of cutting the cable will no longer be effective. Then, in case of disastrous floods, such as that which devastated Dayton, where populous cities were cut off from communication for several days, the rupture of telephone or telegraph wires will no longer isolate the stricken district.

NEW CLIP FORCEPS FOR CLOSING WOUNDS

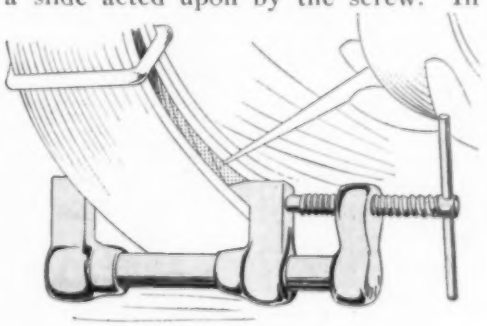
A wound-clip forceps has been invented which makes the busy doctor in a large measure independent of sutures and needles and enables him to secure perfect apposition of wound edges without torturing his patient or subjecting him to the danger of stitch abscesses. With the forceps and its magazine of aluminum clips goes an apposition forceps with which the lips of the wound are brought together. The jaws of the suturing instrument then ride the apposed edges and a single pressure of the surgeon's fingers fastens the metal clamp in place. Another movement of the thumb brings the next clip into position, and it is possible, under favorable conditions, to suture a 4-in. wound in two or three minutes. The clips are flexible and any degree of tension can be secured by elevating or depressing the center of the band.



New Wound-Clip Forceps with Magazine Containing 25 Clips

SPRING-LEAF SPREADER FOR AUTOS

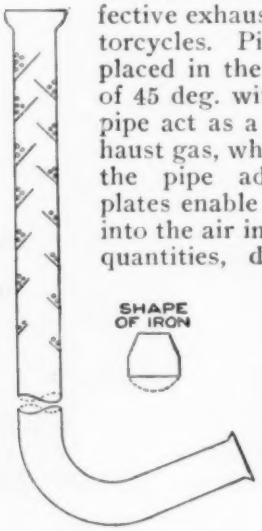
The difficulty of prying apart the leaves of an automobile spring when oiling is necessary has resulted in the marketing of this simple spreader. It is a screw clamp having a wedge-shaped projection on each side, one on the body of the clamp and the other on a slide acted upon by the screw. In addition to spreading the leaves for oiling, the clamp can also be used, in the event of a leaf breaking, to hold the spring together while the car is being driven to its garage.



The Leaf-Spring Opener in Use

SIMPLE EXHAUST SILENCER FOR MOTORCYCLES

By using an exhaust pipe arranged as shown in the illustration an inventor is said to have provided an effective exhaust silencer for motorcycles. Pieces of sheet iron placed in the pipe at an angle of 45 deg. with the axis of the pipe act as a baffle for the exhaust gas, while holes drilled in the pipe adjacent to these plates enable the gas to escape into the air in small distributed quantities, doing away with the noise caused by a single blast. This device is said to be so effective that practically no gas escapes from the end of the pipe, all having passed through the holes.



¶Approximately 110,000,000 horseshoes, or one for each human being of the United States, were made in our country during 1912.

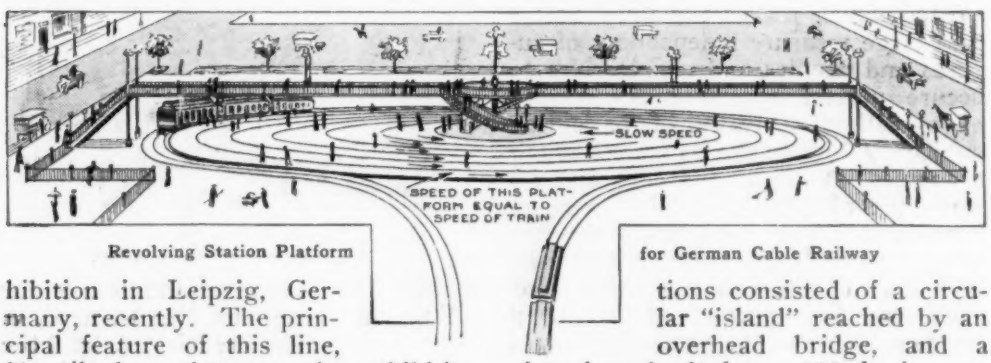
TELEPHONE MAKES COST KEEPING EASIER

The telephone is used successfully in a Chicago establishment as a means of keeping track of the time spent by employes on repair work and special jobs. Each department in which work outside of the regular routine is done is connected by telephone with a central switchboard, the operator at which has nothing else to do but record the time of employes. A worker, taking up a particular piece of work, calls this switchboard and gives the number of the job on which he is starting. The time is recorded on a job ticket by the operator, and when the work is finished the worker calls up again, announces that the job is done and gives the number of the next one to be undertaken. In this way the exact cost to the establishment of each job is readily computed.

¶All the machinery for the largest electrical installation in Asia, at the Cauvery Falls, Mysore, has been ordered from America, except the water wheels, which are being made in Switzerland.

REVOLVING PLATFORM FOR CABLE RAILWAY

A possible means of moving congested bridge traffic is suggested by a cable railway which was used during the international building-materials exhibition in Leipzig, Germany, recently. The principal feature of this line, ⅓ mile long, between the exhibition grounds and the little suburban garden city, Marienbrunn, was that its trains ran without stopping and were loaded and unloaded from moving platforms of circular form. Each of the two stations consisted of a circular "island" reached by an overhead bridge, and a ring-shaped platform, 108 ft. in outside diameter, revolving about the

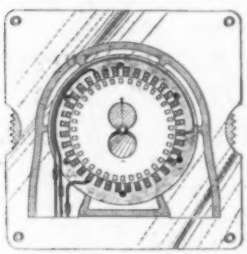


Revolving Station Platform for German Cable Railway

island. Passenger cars, drawn by the same underground cable that revolved the platform, ran on a line between the stations and circled each station around the outside edge of the revolving platform. As the speed of the revolving platform was from 2¼ to 5¼ ft. a second, an easy walking speed of three miles an hour, at the inner edge, and from 9 to 14 ft. a second, the speed of the train, at the outer edge, passengers could step from the stationary island to the revolving platform and then to the moving train without danger. The platform was made of iron and weighed 57 tons. The idea of a continuously moving train, often suggested for bridge traffic, is made more practical by the revolving platform which permits a higher train speed.

A HANDY DEVICE FOR ELECTRICIANS

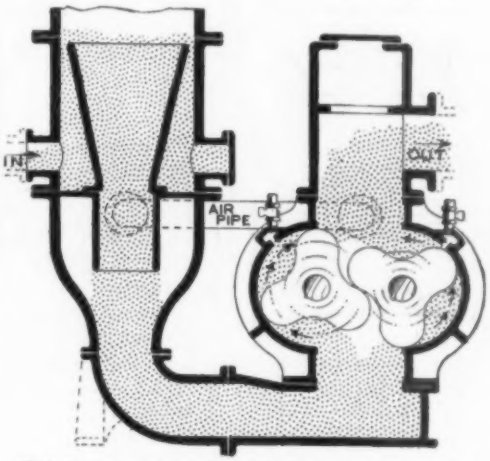
A hand-operated device made entirely of celluloid, a fraction of an inch in thickness and small enough to be carried in the vest pocket, has just been designed for the purpose of showing electrical students and electricians, in a simple and correct manner, how the so-called revolving field is produced by the action of alternating currents in a three-phase alternating-current induction motor. The indicator is nothing more than a revolving wheel having a toothed edge, for convenience in turning with the finger, marked upon its surface with certain colored lines and inclosed between two square pieces of celluloid upon which are printed the symbols and marks necessary to quickly compute the result for which the device was constructed.



¶A course in real estate has been added to the curriculum of Western Reserve University.

A VALVELESS VACUUM PUMP

In the valveless vacuum pump water or other liquid is lifted by two three-lobe impellers, which work together like the parts of a gear. These impellers, however, are not in contact with each other or with the sides of the chamber, the return water, lying on the tops of the impellers, acting as a sufficient seal. The course of the liquid in passing through the pump is shown by the arrows.



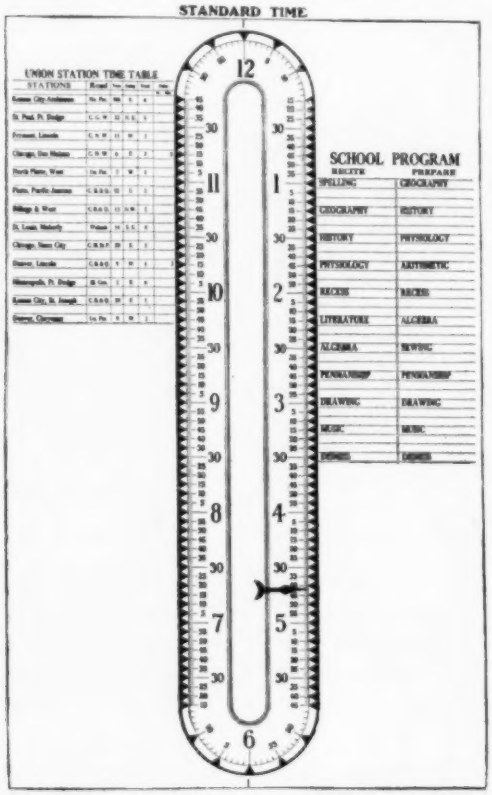
This Vacuum Pump Has No Valves, the Impellers Working Together Like the Parts of a Gear

"TROUBLE" LAMP FOR AUTOMOBILES

A substantial "trouble" lamp that can be used in any position, under or around the automobile, is being marketed by an eastern firm. The handle is in the form of a hook, which can be slipped over any available part of the car when both hands are required for repair work. The outfit is carried in a neat plush case.

VERTICAL CLOCK DIAL WITH ONE HAND

The vertical one-hand clock dial, which has just appeared, is the first improvement in clock faces since the in-



A Clock with a Vertical Dial and Only One Hand Which Moves Up and Down the Sides

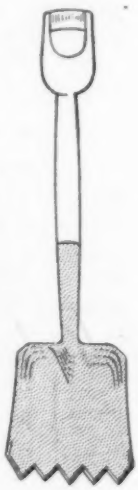
vention of the circular two-hand face over 1,100 years ago. The new dial is a long narrow strip with six hours, divided into five-minute sections, on each side. A single hand travels down one side and up the other, making two round trips a day and pointing out the hours and minutes along its path. The chief advantage of the vertical dial is that the one hand, while telling the time, may also follow the numbers in a schedule, program, or time-table, arranged in the space along the sides opposite the proper hours and minutes. The hand is moved along by a sprocket chain passing over the minute wheel of an ordinary clockwork at the lower end and a loose wheel at the upper end.

ARTIFICIAL PEARLS MADE FROM GELATIN

A new process of manufacturing artificial pearls is said to equal any of the methods heretofore employed in the quality of the finished product, while it is less expensive than some processes now in use. It is based on the fact that certain alkali phosphates have the property of rendering pure gelatin iridescent. Small glass beads are used as nuclei for the artificial pearls. These are dipped into a warm solution of gelatin and then placed on a gelatin-coated glass plate. On the gelatin surface of the plate, forming a ring around each bead, is then applied with a small brush the phosphate solution. This is absorbed by the gelatin, and is soon diffused through the coating of the bead. As soon as the iridescent effect desired has been produced, which must not be accomplished too rapidly, the "pearls" are exposed to the vapors of formaldehyde, which hardens the gelatin and renders it insoluble.

NEW TYPE OF SHOVEL WITH TOOTHED CUTTING EDGE

An improved type of shovel, which, it seems, possesses many advantages over straight-bladed tools of this kind, has been placed on the market. The main improvement consists in teeth being cut in the blade. These teeth, which project 1½ in. from the blade, are slightly rounded at the points and it is claimed they are self-sharpening. After the teeth have been worn down to the blade the shovel can still be used, thus making it practically a tool with a double life. It is clear that less labor is required to use the new type of shovel, as its teeth cut their way into the material.



HIGH-PRESSURE GAS FOR CITY LIGHTING

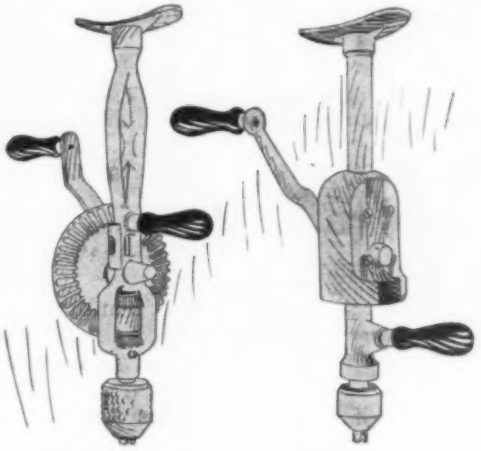
One of the latest improvements in street lighting consists in using gas at a high pressure, with the result that the lamps have a candlepower enormously greater than that of the ordinary street lamp with which we are all familiar. Following several years of experimenting, high-pressure gas lighting was decided on for the principal streets of Berlin, and visitors in that city are amazed at the abundance of light with which the streets are flooded. With the regular low-pressure gas, the lamps were limited to a maximum of 400 cp. This results when the pressure in the mains is maintained at about 2½ oz. per square inch. With a pressure of 2½ lb. per square inch lamps are easily capable of giving from 500 to 4,500 cp. The municipality of Berlin was so well satisfied with the results of the experiment that an appropriation of $1,660,000 was made for installing the system, the installation being made gradually in accordance with a definite program. The adoption of high-pressure gas lighting requires the installation of special high-pressure mains connecting the lamps with compressor plants at the different gas works. The cost of compression is said to be very low. The pressure is automatically kept constant, and the compressor plants at the different gas works are so connected that one set or all can supply the lamps.

Since the installation of high-pressure gas lighting in Berlin, practically all the principal cities of Europe have adopted the system, the most notable cases being London and Paris. This system will be one of the leading features at the Panama-Pacific Exposition, where it will be used extensively for the lighting of the grounds and concessions. As a safeguard against any possible failure of the electric supply, gas lights will be distributed throughout the electrically lighted sections.

¶New York City uses about 19,000,000 tons of coal annually.

ACCIDENT PREVENTERS AND SAFETY TOOLS

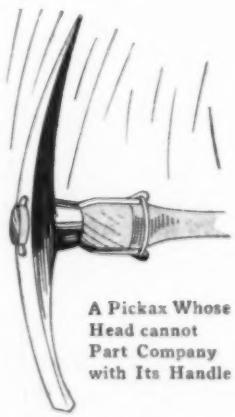
Among the many "safety" tools and accident-prevention devices passed upon as having great merit, and given



American Breast Drill with Exposed Gears

The "Safety" German Breast Drill

the "hall-mark" of the American Museum of Safety, are the four shown in the accompanying drawings. The "safety" breast drill, which comes from Germany, is shown beside the ordinary American breast drill, so as to accentuate the inferior qualities of the latter. All the gears are inclosed in the German tool, so that, should the hand slip, there is no danger of the fingers getting mangled. The dangerous construction of the American breast drill is apparent.



A Pickax Whose Head cannot Part Company with Its Handle

The committee which passes upon all new devices submitted to the American Museum of Safety was particularly enthusiastic over the pickax. The means used for holding the head on the handle is very simple, yet such

that it is practically impossible for head and handle to part.

The little handle-and-ratchet arrangement shown at the side of the carboy holder prevents the carboy from rocking and thus splashing its content of acid over the workman, should his hand slip from the rocker handle when the carboy is tipped over for discharge. The device breaks the force with which the carboy swings back to an upright position and then locks it in that position.

A "Safety" Carboy Rocker

When bundles of steel rods are being transported through the streets of American cities the outer ends usually protrude from the wagon in such manner as to be extremely dangerous should pedestrians approach too close, particularly when the wagon is rounding a corner. In Germany this danger is usually minimized by hooding the protruding ends of each bundle. The hoods used for the purpose are made of leather, and are heavily padded, so that they not only minimize the danger of accident, but also do away with much of the noise of steel clanging on steel.

STRONG DEFENSES OF THE CANAL ZONE

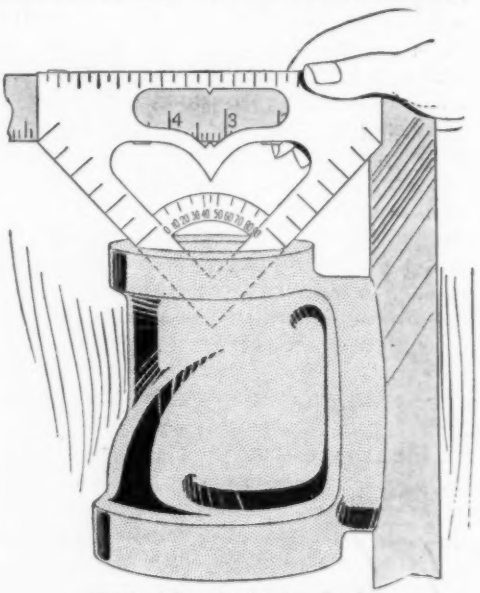
Recent experiments with the mortars provided by the Ordnance Department for the defense of the Canal Zone, developed a range of 19,300 yd., or about 11 miles. These mortars are expected to give the fleet defending the canal protection against any attacking fleet until they can form in battle line. The former range of 12-in. mortars was but 7½ miles, and as the navy had been making hits at that distance it was felt the range of the coast-defense guns should be so increased as to keep an enemy at safe distance.

NEW CLOTHES WRINGER HAS PNEUMATIC ROLLERS

A clothes wringer with pneumatic rollers has been put on the German market. The advantage of the inflated rollers over those of solid rubber lies mainly in the fact that pressure is exerted on all parts of fabrics passed between the rollers even when the garments are not especially arranged. Buttons, hooks and eyes are not crushed by the roller. A bicycle pump is used to inflate this novel wringer.

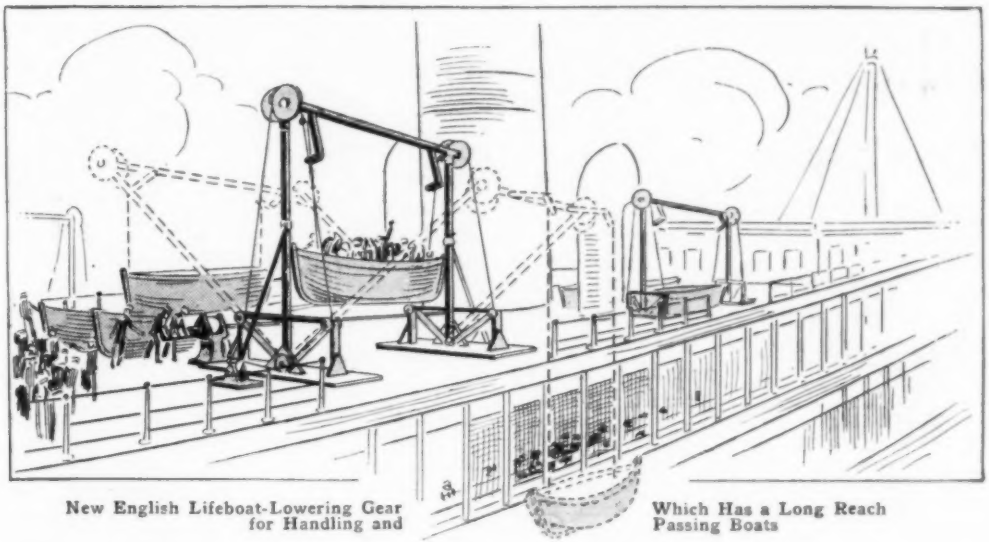
PIPE CENTERS ARE FOUND WITH NEW DEVICE

A handy device, known as a center finder, designed to determine the center measurement of pipe fittings, such as elbows, tees and crosses, is now being used by plumbers and steamfitters in this country. It is used with a steel square for finding the center, a pointer marking the line. This instrument, an application of which is shown in the accompanying illustration, can be used for several other purposes, among which the striking of proper angles in laying out piping is one.



Determining the Center of a Pipe

LIFEBOAT DAVIT WITH LONG REACH



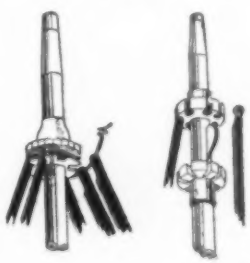
New English Lifeboat-Lowering Gear for Handling and Passing Boats Which Has a Long Reach

Among the many devices for handling lifeboats that are being designed to meet the demand for "boats for all," even on the largest liners, there is an English boat-lowering gear that is an adaptation of old methods rather than a radical innovation. It is a lifeboat davit with a "long reach," designed to launch a large number of boats quickly and safely. Standing near the rail of the top deck, it can pick up boats stowed many feet inboard and swing them far out over the ship's side or pass them over within reach of a similar davit at the opposite rail to be launched on the other side.

The long reach is accomplished by pivots near the deck, which enable the upright posts of the davit to tip inboard or outboard, and by additional derrick arms which turn automatically so as to carry the boats in a horizontal line across the deck and extend the lowering gear beyond the ends of the upright posts. All the movements of the davit and lowering gear are operated by one shaft which is turned continuously in one direction by electric or hand power. As the same shaft may furnish power for four pairs of davits and the control levers for the various clutches are in one place, one officer with a couple of men to hook the falls can launch all the boats stowed in one section of the deck. And he can launch them all on the safest side of the ship. Automatic devices keep the ends of the boats level and insure a launching on an even keel. The passengers can take their seats in the boats before they leave the deck, or from any deck below.

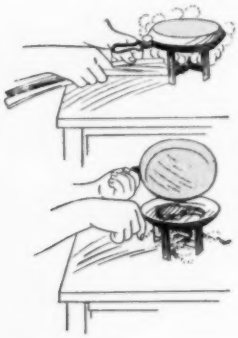
WIRELESS UMBRELLA BUILT FOR STRENGTH

A new-model umbrella, recently patented, makes use of the ball-and-socket joint for holding the ribs together instead of the old wire fastener. In the new model any rib may be detached without disturbing the rest of the umbrella; there are no holes in the ends of the ribs and stretchers, and no wires to break out and tear through the cover, nor rust and break, and the ribs are so placed that the umbrella cannot "turn wrong side out."



FRYING A STEAK WITH A NEWSPAPER

A rapid cooker that will fry a steak in a very few minutes with the heat of a torch made of a folded newspaper has just been brought out by a French inventor. As it will cook other foods with equal quickness and economy, it will probably be very useful to soldiers, campers and travelers.



The little cooker, which weighs less than a pound, consists of two thin metal plates that fit together tightly, a handle, and a metal standard. Its great efficiency depends upon the fact that no heat or vapor can escape from inside and little heat is required to warm the cooker itself.

CHANGEABLE BRISTLES FOR TOOTHBRUSHES

The use of many sets of bristle holders in a single handle is a new idea in sanitary toothbrushes which has recently appeared. The handle, made in two pieces pivoted together like a pair of scissors, is arranged to clasp any one of a number of interchangeable brush members. When a new toothbrush is needed, the handle is opened, the old bristle brush is thrown away, and a new one is slipped into its place. Since the handle is permanent, it can be made of gold or silver and ornamented in any way.

More than 22,000,000 tons of coal are consumed annually in the Pittsburgh district.

FLOATING SIXTY-TON BOILER FROM SHIP TO SHORE

A boiler recently shipped to the Panama Canal was too heavy to be handled by any derricks available on the isthmus, so the furnace and tube holes were securely plugged and the boiler was lowered into the water from the ship and floated ashore. The boiler is 14 ft. long and 15 ft. in diameter, and weighs 60 tons.

NEW INVENTION MAKES GUN CARRYING EASY

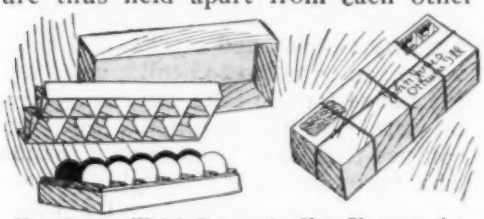
An improvement in the method of carrying a gun on a hunting trip when not in use has recently been patented, consisting of a leather strap, one end of which is snapped onto a hook near the end of the barrel, and the other mounted on a steel roller spring. When the strap is not wanted, it may be unhooked and the spring will reel it up on a shaft in the casing, or if not unhooked, it will be firm underneath the barrel of the gun.

SPIRAL COILS ANCHOR SCREWS IN CEMENT

A new screw anchor for use in cement work has been patented recently. It consists simply of a spiral coil into which the screw is inserted, and is guaranteed to have a holding strength of 2,500 lb. Stock sizes range from ¼ by 2 in. to 1 by 30 inches.

FLEXIBLE EGG CARRIER SAVES LOSS

Soft-boiled eggs that are "just laid" are possible now that the parcel post is supplemented by a device which is claimed to "really carry eggs in the mails without breakage." In a recent invention, a pasteboard box folds in such a way as to truss the box, giving it unusual strength. The illustration shows each egg suspended in an individual compartment, between upper and lower pyramids, giving eight points of contact. These compartments, being flexible, accommodate themselves to eggs of various sizes, and when the box is tightly tied the eggs do not roll or rattle. The eggs are thus held apart from each other



New Device Which Brings the Hen Closer to the Breakfast Table

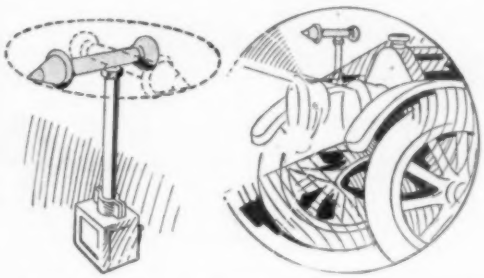
and away from the sides of the box, so that the box will stand not too rough handling.

GERMAN NAVY BUILDING TWO MORE DIRIGIBLES

Undaunted by the loss of the two naval Zeppelins, "L 1," which was wrecked in a storm on the North Sea, and "L 2," which caught fire in the air and fell to the ground from a height of 500 ft., the German naval authorities are building more dirigibles. The "L 3," a new Zeppelin, and the "L 4," a Schütte-Lanz, are expected to be completed by April 1, 1914, and will be housed in the double dirigible shed at Cuxhaven. Pending the completion of these airships, the government has leased the two passenger dirigibles, "Sachsen" and "Viktoria Luise," and these are to be used as training ships for the German aerial navy until the new ones are in commission.

NEW DIRECTION-SIGNALING DEVICE FOR AUTOS

This arrow-shaped direction indicator is mounted on the front of the car and operated by the driver by

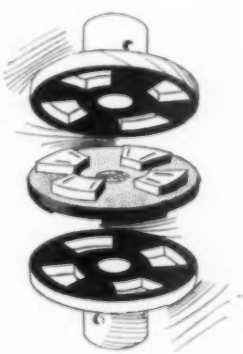


Direction-Signaling Arrow for Front of Automobile

means of a small lever on the steering column. A steel rod passing under the hood, with universal-joint connections, runs to a gear box on the radiator. The pointing of the arrow to right or left indicates to the traffic officer when a turn is to be made. At night the arrow is electrically lighted and can be seen for two blocks.

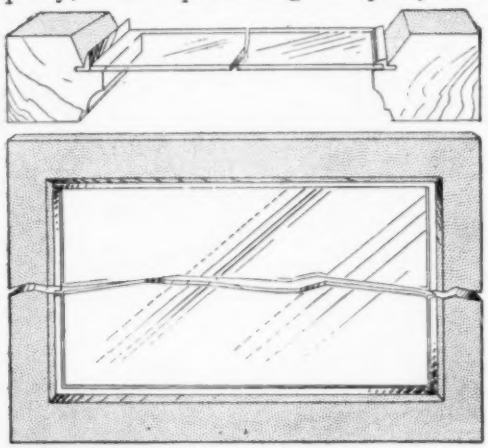
FLEXIBLE INSULATED SHAFT COUPLING

A coupling designed for the transmission of power from one shaft to another where electrical insulation and a slight degree of flexibility are desired, is shown in the illustration. The two outside flanges are attached to the shafts either by keys or setscrews. The central disk is made of leather and has lugs cemented or riveted to the sides. The disk supplies the insulation, and the lugs transmit the power to the outside flanges. This coupling will adjust itself to slight imperfections in the alinement of the shafts.



SECURING WINDOW PANES WITH LEAD

Fastening window panes into their frames with strips of lead instead of putty, thus producing a puttyless



A Window Glazed with Lead Strips Instead of Putty

window, is one of the latest advances made in building construction. This type of window does away with the use of glazing points and the pressure of the lead inlay on the glass is uniform throughout. The puttyless window is claimed to be waterproof, dustproof, and air-tight; does not rattle or corrode, and will not peel off. When the glass is broken a new light may be put in by simply bending back the lead strip, dropping another glass into place and pressing down the strip again.

WIRES USED FOR CUTTING MASONRY AND CONCRETE

A trench for carrying electric-light cables has been cut through the solid masonry and concrete of the Pont Neuf bridge over the River Seine in Paris, France. This trench is 4 ft. wide, 7½ ft. deep and 550 ft. long. The Pont Neuf bridge has been standing for about 300 years, and on examination it was found that the material was too hard to be cut by tools, while explosives were out of the question on account of the danger of weakening the arches. The work of cutting was finally done with helicoidal wires, which on account of the spiral ribs on their surfaces, cut into the hard material more rapidly than plain wires would have done. The bridge was divided into three sections, each about 180 ft. long, and the wires for cutting each section were operated as continuous belts by 18-hp. motors. An abrasive powder was used for making the cutting more rapid.

CLOCK WITH SINGLE HAND TELLS TIME ACCURATELY

A new clock face, or dial, has been patented which may be placed on any clock and by removing the hour hand, and placing the minute hand on the hour spindle, transforms the clock into a one-hand, easy-to-read time teller. Children have difficulty in telling the time by two-handed clocks, and those who have occasion to send a child into the house for the time can hardly ever be sure that the youngster does not confuse the "long" and "short" hands. The accompanying illustration shows how simple is the device by which neither dark days, glare on the glass of the clock face or a child's inability to distinguish between hour and minute

A Clock Face Which Tells the Correct Time with One Hand

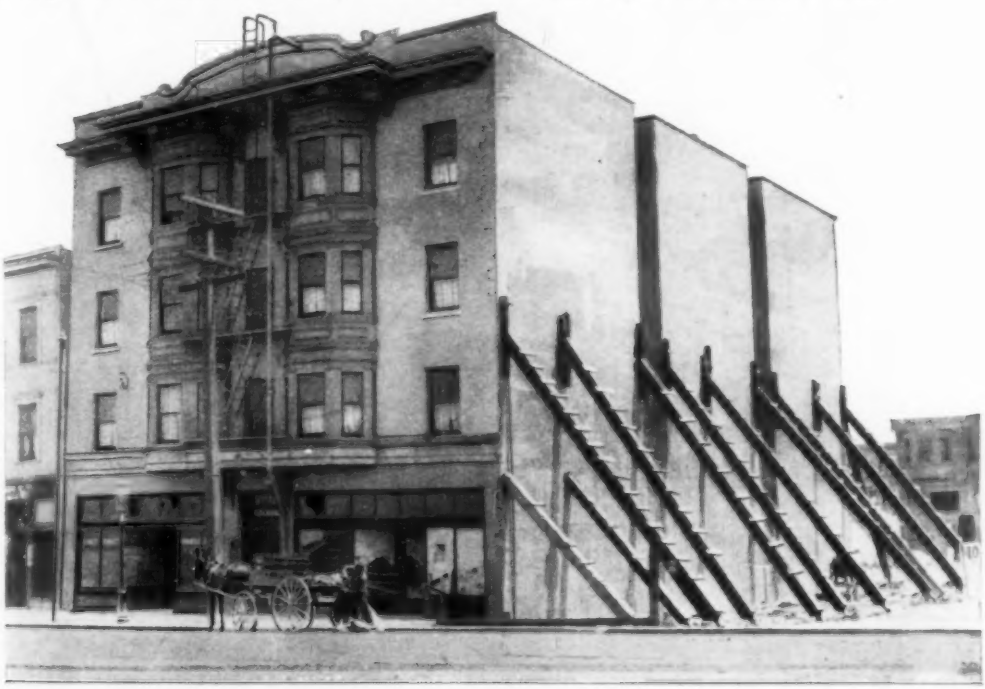
hands can prevent correct time reading. In this there is no possibility of one mistaking, for instance, five minutes after twelve for one o'clock.

BUILDING MOVED AND SET BACK ON NEW FOUNDATION

Putting a new foundation under a building as it stands on the old foundation or on underpinning is not an uncommon proceeding, but to take a four-story concrete building, move it to an adjoining lot, install the new foundation and then move the building back into its original position, as was recently done in San Francisco, is an unusual undertaking. The structure handled in this fashion is a four-story hotel and business building with a frontage of 50 ft. and a depth of 85 ft., and weighs about 2,500 tons. Owing to defective foundations one end settled until the walls were about 2 ft. out of plumb. Investigation showed the bed of an old slough underlying the lot, so it was necessary to drive the new foundation through the mud and silt to a solid footing. The building was first cut in two at the second-story level and the upper portion moved to the adjoining lot, after which the first story and foundations were torn out. About 142 piles were driven to support new piers, on which new walls for the first story were built, and the upper portion was then moved back to its permanent position.

STYLES IN WOMEN'S DRESS CONTROL AUTO DESIGNS

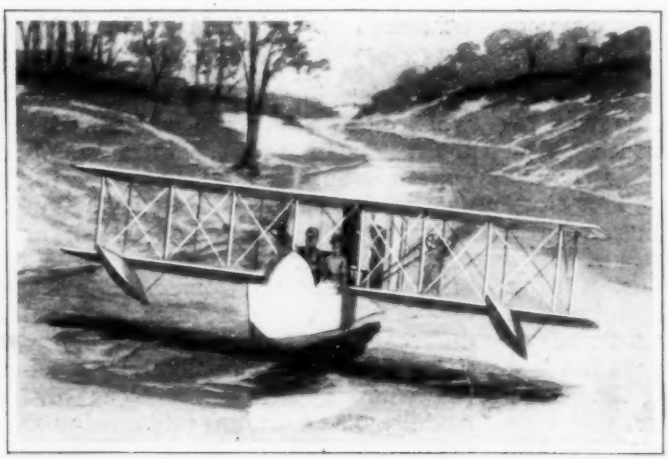
Upholstering of extreme depth, which not so long ago was considered the acme of comfort in automobile construction, has given way to a design in seats and springs made necessary by the long-waisted, narrow-hipped corset and sheath skirt affected by society women. The shape of the seat today is, therefore, quite different from that in use two or three years ago. The upholstering is of a character suited to present dress models, and lavender seats for day and gray seats for evening are demanded by the ultrafashionable. Not only have the seat cushions been changed, but the body of the car, its springs and the construction of the chassis reflect current styles in women's wear.



San Francisco Building That was Moved and Then Set Back on New Foundation

NEW FLYING BOAT ADAPTED TO INLAND RIVERS

Small rivers with their bends and twists, and inland lakes affording no opportunity for long runs have not heretofore been available for navigation by flying boats. A recent development of flying craft by Orville Wright makes possible air-water travel in such localities, in that the boat rises quickly, and is under perfect control, thus avoiding trees and high banks with ease. The motor is placed low in the hull, and the seats high, the exact opposite of previous practice. By this method the motor is protected from spray, the operator is in a safer position, and the balance of the machine is improved.



Flying over Small River Lined with Trees

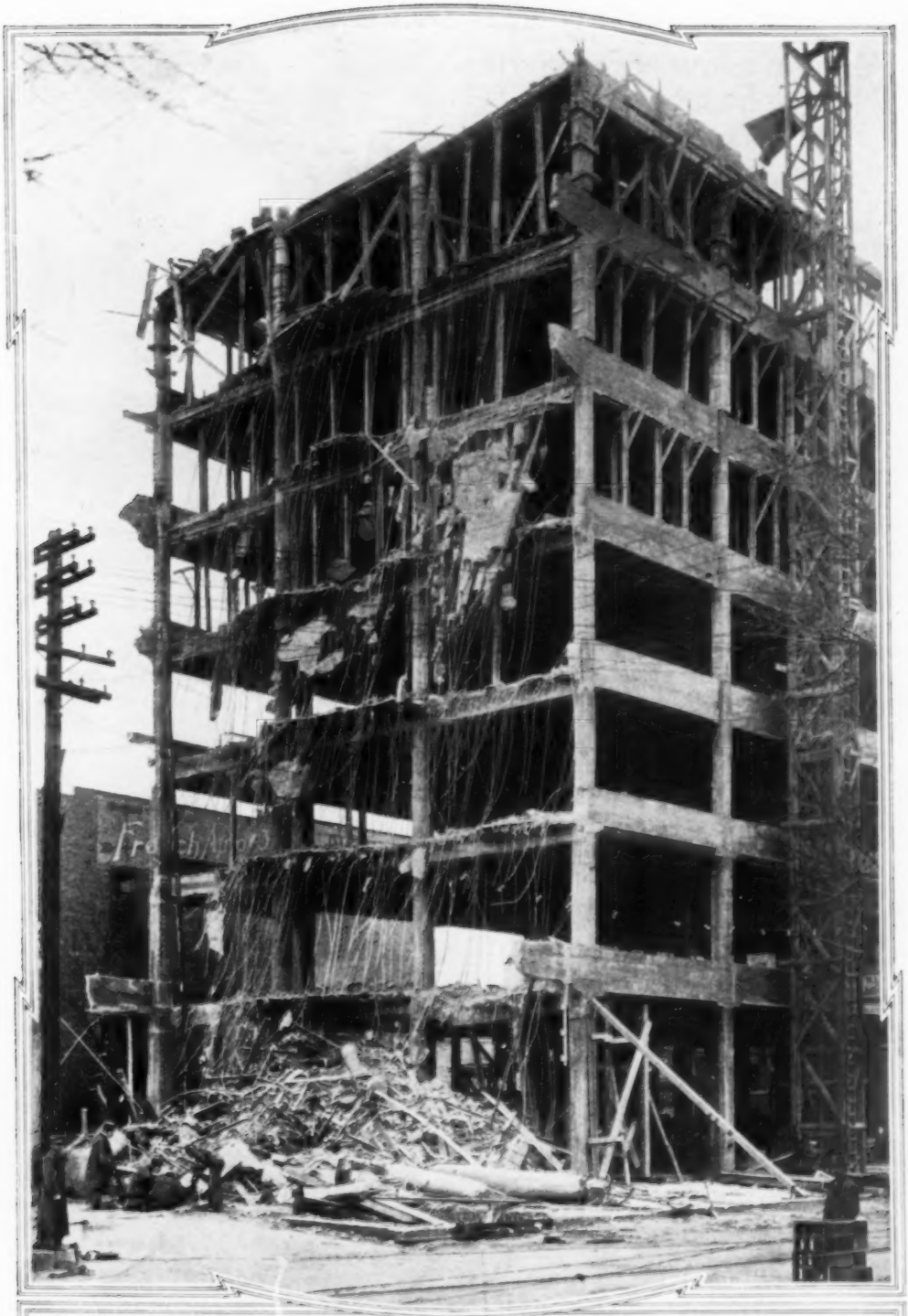
NEW TYPE OF DANGER SIGNAL BENEFITS COLOR-BLIND

A colored danger signal consisting of a blue circle placed within a yellow rim is being advocated for use in industrial plants. Although red is now almost universally used as a danger signal it is far from satisfactory for that purpose, since of the 4 per cent of all men who are defective in color perception the majority are unable to distinguish red. Yellow and blue are the most luminous colors of the spectrum, and a combination of these colors can be seen at a greater distance in daylight and is more easily distinguishable in poor light than any single primary color or any other combination of colors. In addition to this it has been found by experiment that this combination appears as red or green to workmen who are unable to distinguish yellow and blue, so that a definite danger indication is given in any case.

¶In the year ended June 30, 1913, 651 new ocean-going vessels were built in the entire world, with total registered tonnage of nearly one and three-quarter million tons.

COLLAPSE OF REINFORCED-CONCRETE BUILDING

When a section of a new reinforced-concrete building fell recently, in Cedar Rapids, Iowa, it is estimated that more than 2,000,000 lb. crashed down upon the first floor without crushing it down. The concrete roof had just been laid on the section, 40 by 60 ft., when the false woodwork gave way, letting the floors fall, one after another, until the entire mass piled up on the ground floor. This was of heavy concrete construction, weighing more than 100 lb. to the square foot, and it resisted the shock, breaking only in a few places. The steel reinforcing bars did not break or shear, but pulled out from the concrete and hung down like fringes from each floor. Several fatalities resulted from the accident, which occurred in the afternoon while a full force were at work. The building was 97 ft. high and sufficient warning was given before the roof fell, through the cracking of timbers and concrete, to permit the escape of most of the men at work.



While the Roof of This Building was being Poured, the Supports Gave Way and the Entire Section Fell

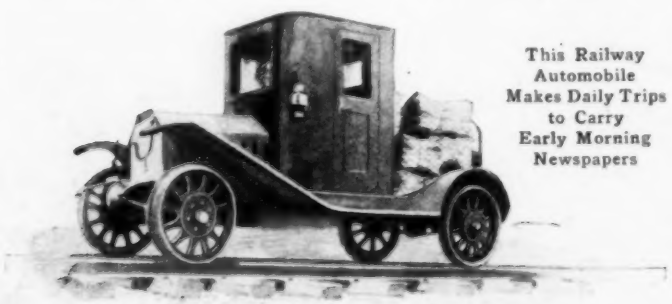
FOLDING PLOW FOR FIGHTING FOREST FIRES

Fighting forest fires calls for quick work and lots of it. One man on the right spot, at the right time, may prevent fire losses running into hundreds of thousands, but he must be equipped to do the most work in the best way. The supervisor of the Malheur National Forest, Oregon, has invented a collapsible plow for use in the work of the Forest Service, which digs fire lines faster than 20 men with shovels. The plow may be dismantled and folded into a compact form, so that it can be carried on horseback. It weighs only 40 lb., and when in use, one man with a horse can do an amazing amount of protective work, and head off a fire that, unchecked, might lay waste many square miles of standing timber.

New Plow Used by Forest Service in Fighting Fires—Folded, for Easy Conveyance on Horseback

RAILROAD AUTO CARRIES NEWSPAPERS

A specially constructed railroad automobile, called "The Advertiser Special No. 9" and built to carry the daily issues of a southern newspaper from its place of publication to an adjoining city every morning over the rails of the road connecting the two cities, is shown in the photograph reproduced on this page. It is built out of the chassis of a 45-hp. machine which had been used as a pleasure car for two years and then burned in a fire. The new steel body, consisting of a cab and a compartment for bundles of newspapers, is fitted with all the latest electric equipment. The wheels have wooden spokes and felloes and steel tires turned down from standard engine tires. By the use of two standard transmissions, the car is able to make high speed in either direction. It is painted to match the regular passenger cars on the line and runs on schedule, under dispatcher's orders. On its first trip it made a mile in 62 seconds or a little over 58 miles an hour.



This Railway Automobile Makes Daily Trips to Carry Early Morning Newspapers

IRRIGATION OF BOMBAY AN ENORMOUS PROJECT

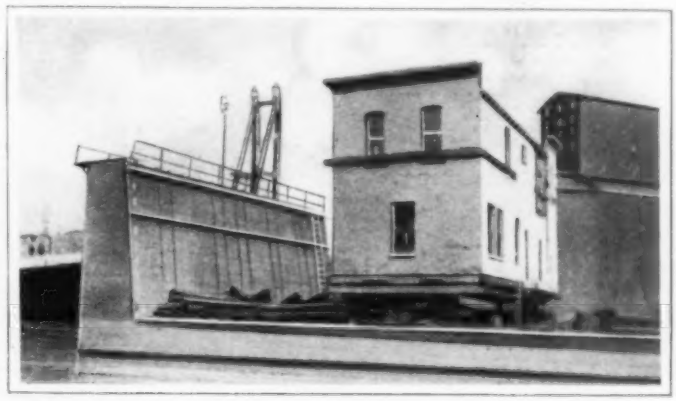
One of the biggest irrigation projects ever attempted, covering the whole of the Bombay Presidency, is now being considered by the government of India. There are 55 schemes awaiting sanction, but serious consideration will be given only to such as will undoubtedly fulfill all the required conditions, a policy brought about through the fact that many of the earlier irrigation projects have failed to prove remunerative. It is planned to irrigate about 9,980,000 acres of land, involving an estimated expenditure of $182,493,750.

IMPROVED METHOD CURES FISH QUICKLY

An improvement in methods of curing fish makes it possible to preserve them so perfectly that two weeks after preservation, which is sufficient time to ship this food from the North Atlantic fisheries to any city in the United States, or to the West Indies and some ports in South America, the fish are as fresh as when first drawn from the water. Based upon the theory that putrefaction of fish is caused by bone taint, the improved method acts as a preventive of bone taint by removing the specific, or animal heat, from the fish. The fish are dumped into a tank holding sea water, filtered through willow charcoal; next brown sugar is added to act as a germicide, and finally the temperature is lowered to 14° F., during which time 16.1 per cent salt is added to prevent ice formation.

HOUSE MOVED ON FLOATING DRY DOCK

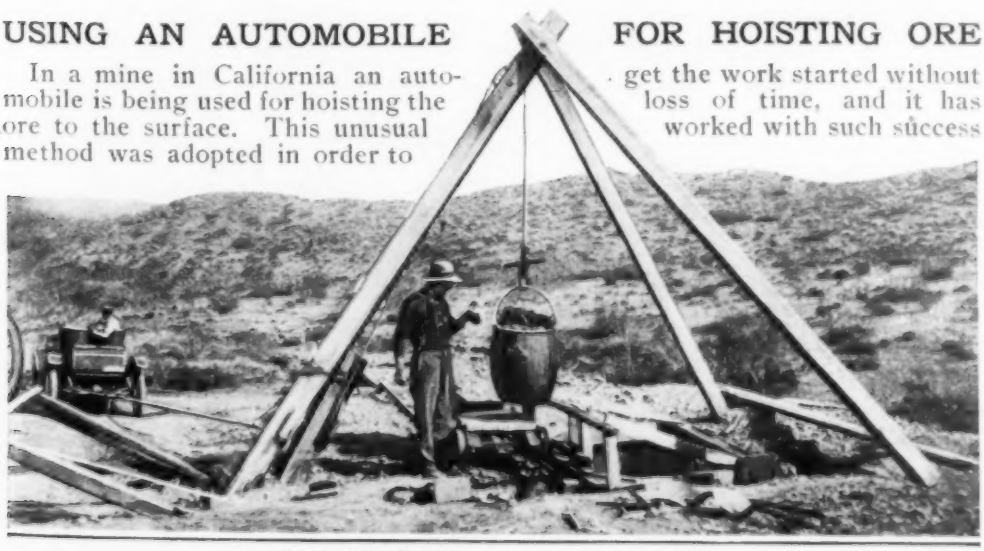
One of the most novel of house-moving methods was that employed in Manitowoc, Wis., recently, when a floating dry dock was pressed into service and used for conveying a solid two-story brick office building from its old location to a new site several blocks away. It is stated that not a brick in the structure was broken and that the office furniture was not disturbed in the least.



Brick Building Loaded on Floating Dry Dock and Moved to New Site

USING AN AUTOMOBILE FOR HOISTING ORE

In a mine in California an automobile is being used for hoisting the ore to the surface. This unusual method was adopted in order to get the work started without loss of time, and it has worked with such success

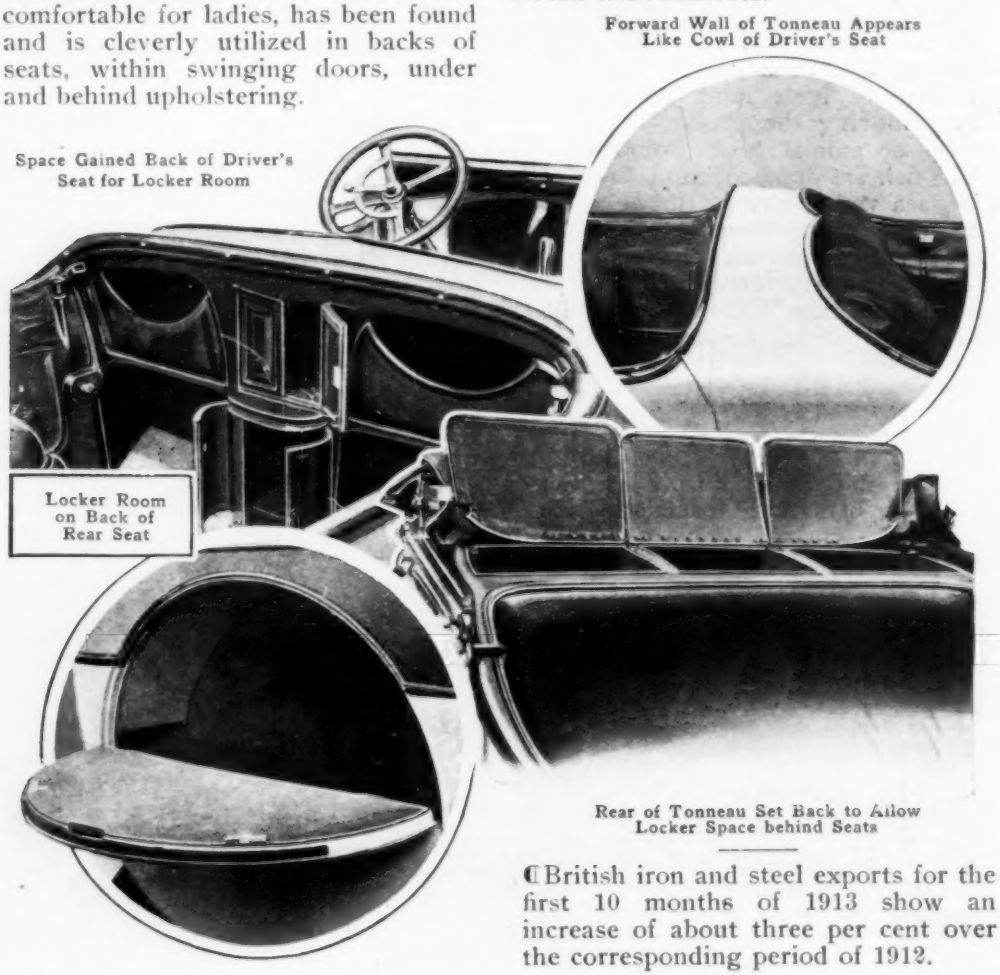


Automobile Supplies Power for Hoisting Ore

that the owners of the mine now expect to go to a depth of at least 400 ft. and to take out many thousands of dollars worth of ore before it is necessary to install hoisting machinery. In sinking the first 20 ft. of the shaft only 1½ gal. of gasoline was used.

AUTOMOBILES WITH PLENTY OF STORAGE SPACE

"Closet room" in plenty, and to spare, appears to be the last word in automobile designing, if the models shown in the 1913 Automobile Salon at Paris are a criterion. Available space for wraps, for luncheon and dishes, for baggage and accessories and for the knickknacks which make travel comfortable for ladies, has been found and is cleverly utilized in backs of seats, within swinging doors, under and behind upholstering.


Forward Wall of Tonneau Appears Like Cowl of Driver's Seat
Space Gained Back of Driver's Seat for Locker Room
Locker Room on Back of Rear Seat
Rear of Tonneau Set Back to Allow Locker Space behind Seats

NOVEL METHOD OF CLOSING "WILD" GAS WELL

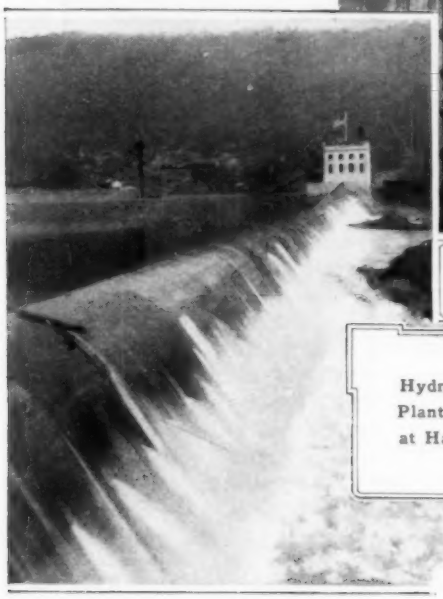
A gas well in Louisiana that had run wild for six years and had been wasting from 10,000,000 to 20,000,000 cu. ft. of gas a day during that period was successfully closed recently by a method that is probably unique in the history of the gas industry. A relief well was first bored close to the old well, and to the same depth. Water and mud were forced down the relief well under heavy air pressure until the gas stratum was choked and the flow of gas shut off. The old well, which had made a crater 225 ft. in diameter and 50 ft. deep, was then permanently closed with concrete.

¶ British iron and steel exports for the first 10 months of 1913 show an increase of about three per cent over the corresponding period of 1912.

IMPORTANT POWER PLANT ON SOUTHERN RIVER

A great dam across the Tennessee River at Hale's Bar, 33 miles below Chattanooga, recently completed, is 40 ft. high and 1,200 ft. long. A lock is built against the west bank of the river and has a clear width of 60 ft. and is approximately 310 ft. long, inside. The gates, which are of the mitering type, are built of steel and operated by electricity and are remarkable for the head they have to support, the difference between the two pools being about 40 ft. The power station is in two sections, one an operating building, and the other a switch and transformer house. The operating building consists of seven bays, each containing two turbine units of three turbines mounted on a vertical shaft with a generator on its upper end. These 14 generators have a total capacity of 43,682 kw. Under ordinary conditions but two turbines will be used in each unit, the third being held in reserve. Alternating currents of 6,600 and 44,000 volts will be delivered over two transmission lines of bare copper cables carried on steel towers to Chattanooga. This plant will supply power for many important industries.

Single-Lock Lift of Nearly 40 Ft.



Hydroelectric Plant and Dam at Hale's Bar

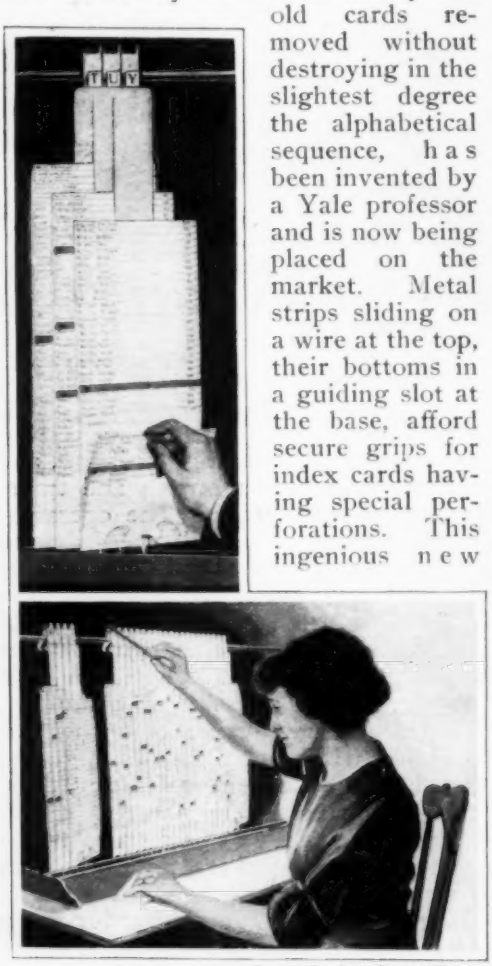
FIRST VESSEL THROUGH THE PANAMA CANAL

The small steamer "Louise," which passed through the Panama Canal on Nov. 17, 1913, with many prominent canal officials and their wives on board, was the first vessel to cross the Isthmus of Panama. A channel was dredged through the Cucaracha slide, the last obstruction which has been delaying the work connecting the oceans. The dredges are now concentrated at this point and a large ship could be sent through on short notice.

¶There is only one species of bird known whose bite is poisonous, the Rpir N'Doob, or "bird of death," of New Guinea. Loss of sight, convulsions, and lockjaw are symptoms which follow rapidly after an attack.

VISIBLE INDEX NEWEST OFFICE HELP

A card index where all the key words are at all times visible, and yet new cards may be inserted readily and old cards removed without destroying in the slightest degree the alphabetical sequence, has been invented by a Yale professor and is now being placed on the market. Metal strips sliding on a wire at the top, their bottoms in a guiding slot at the base, afford secure grips for index cards having special perforations. This ingenious new system is elastic, as many metal strips being added from time to time as may be necessary, and cards may be shifted in groups from one strip to another.



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Novel Index Where Names are Both Visible and Insertable

¶From Tahiti a new fungus is being forwarded to Europe, which emits light resembling that of the glowworm at night. It grows on the trunks of trees and is used as a hair ornament.

MATCHES TO BE SAFE AND NONPOISONOUS

Both the manufacture and sale of matches containing white phosphorus will be brought to an end in this country on July 1, 1915, when the law recently passed by Congress, imposing a prohibitive tax on matches in which this substance is used, will go into full effect. This law was passed after years of agitation and after a long educational campaign that made the public aware of the terrible effects produced on the operatives in match factories through working with white phosphorus, and brought out the fact that there were other forms of phosphorus not of a poisonous nature. Phosphorus is obtained from bones, which consist mainly of phosphorus and lime chemically combined with each other and with organic matter. The two forms most commonly seen are white phosphorus and red phosphorus. The white phosphorus is poisonous, while the red phosphorus is practically harmless.

Under the new law only two kinds of matches will be in use—the so-called "safety" match, which ignites when scratched on a specially prepared surface on the side of the box, and the "bird's-eye" match, which can be ignited on any dry surface after the manner of the white-phosphorus match. The main ingredient of the "safety" match is chlorate of potash, while the surface on which it is to be lighted is painted with red phosphorus. The substance used for the tip of the "bird's-eye" match is sesquisulphide of phosphorus, a compound of a comparatively harmless nature. In making these matches, the first dip coats the end of the match with an inert substance which keeps the match burning after it is lighted, while the second dip places on the end of this substance the sesquisulphide tip. A temperature of over 300° F. is required for igniting these matches. They cannot be ignited through being stepped on, they do not spark or fly, and are not explosive. They are therefore much safer than the so-called "safety" match.

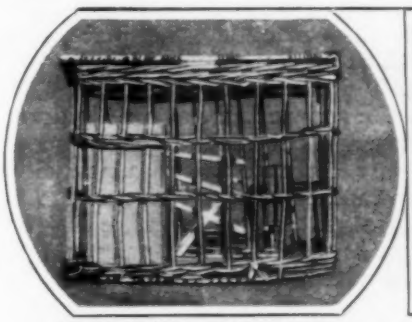
FENCE RAILING SERVES AS WATER PIPE

Using an iron fence railing as a water pipe is the unique means employed in supplying water for a cemetery at Ontario, Cal. The fence is built of concrete with cobblestone posts, as shown, and is of a type much used in that section of the state. The railing, which is a continuous iron pipe running through the posts, is connected with the city water-supply system and is provided at convenient intervals with valves to which a hose may be attached. In winter, freezing is prevented by allowing the water to flow continuously through the pipe.

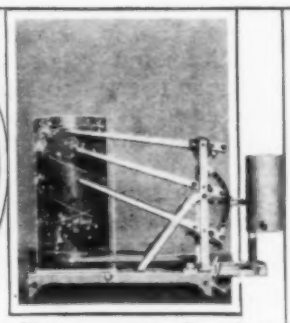
Iron Fence Railing Supplies Water for California Cemetery: Water is Shown Discharging through an Open Valve

BALLOONS USED IN STUDY OF UPPER AIR

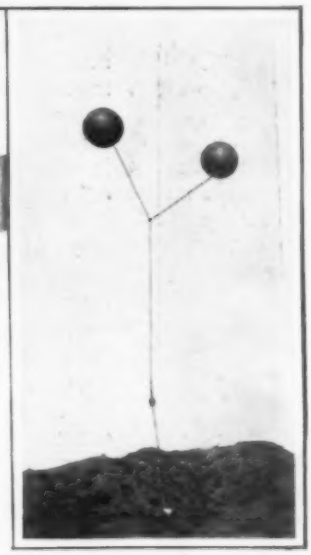
Balloon soundings of the air high above the earth are being used in Southern California by a party of experts of the United States Weather Bureau and the Smithsonian Institution who are trying to discover the cause of the mild, fair weather in that region. By sending instruments carried by balloons into the upper air beyond the influence of mountains and local disturbances, they hope to learn something of the movements of air currents and the conditions which produce storms in fair weather. Among other things, they have found that the temperature of the air 15 miles above the ground in Southern California is 85° F. below zero. The method followed in their first experiment consisted in sending up two 12-ft. balloons fastened together. In a basket carried by the pair of balloons were instruments for registering variations in humidity, pressure, and temperature and recording them on an aluminum cylinder blackened with camphor smoke. As the balloons ascended into the lighter air, they gradually expanded to 20 ft. in diameter. When one of them burst, the other descended, bringing the instruments back to the earth.



Basket in Which the Instruments Were Carried



Meteorograph for Recording Temperature, Humidity, and Pressure



Two Balloons Which Carried the Instruments to an Altitude of 15 Miles

RESULT OF TESTING STEEL USED IN BIG GUNS

That the steel used in making cannon for coast defense is of very remarkable quality cannot be doubted when the accompanying illustration is studied. In the manufacture of cannon every conceivable test is made. In this instance it was proposed to cut off about an inch from the surplus metal at the end of a 3-in. gun, and test the ring thus formed by forcing a cast-iron mandrel through it. In the tapered mandrel one end, of course, was small enough to enter the ring. This operation would tend to stretch the ring, and any defect, tendency to crack or lack of tenacity would be revealed. The ring was placed in a heavy hydraulic press and the mandrel forced through it. The ring stood the test perfectly, but the mandrel was cracked in every direction, though it still held together. From the fact that a small ring of steel from the weakest part of the gun could produce such an effect by resistance to stretching, an idea may be formed of the enormous strength of the modern big gun.

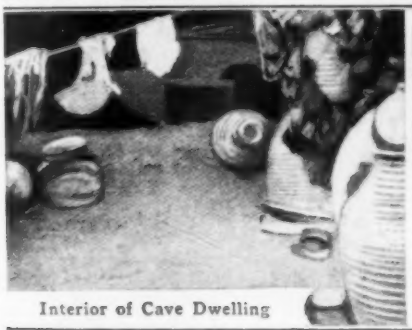
¶The "Seward" and the "Wright," army transports now out of commission in the Philippines, are to be sold, if the recommendation of the War Department is followed. Both vessels are old and in need of extensive repairs, and are too small for present transport requirements.

ARTIFICIAL AMMONIA MADE WITH CATALYTIC AGENT

German chemists have succeeded in producing ammonia on a commercial scale by combining its elements synthetically in the presence of a catalytic agent. The reaction takes place, so it is said, at a temperature of from 752° to 1,472° F., under a pressure of 1,500 lb. to the square inch. This high temperature and enormous pressure necessitated special retorts and a new alloy of iron capable of high resistance. The new process makes possible largely increased use of ammonia salts in agriculture without increased cost.

HOMES OF AFRICAN CAVE DWELLERS

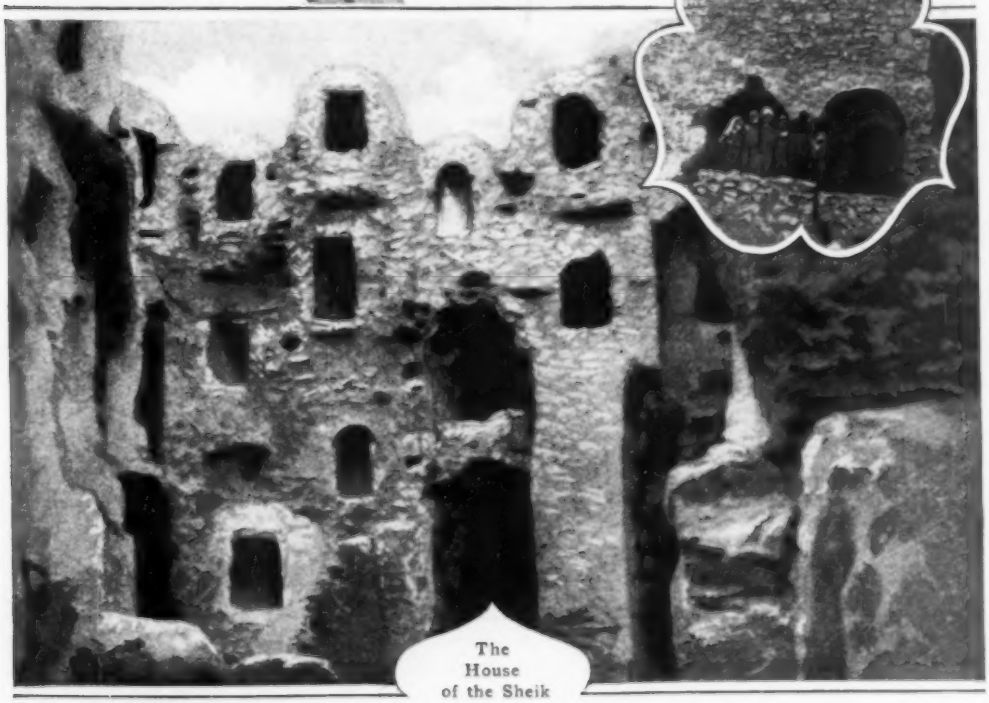
Burrowing underneath the sand and constructing habitations out of caverns in the underlying rock, certain tribes in northern Africa have just come under the observation of scientists. The only visible sign of these dwelling places are the holes in the ground, which are the entrances, some of which are 13 yd. in diameter. The walls are perpendicular and sometimes supported by rough stones. In the walls are irregular holes, some of them closed by rude doors. In the interior of these houses comparatively large rooms are found, with their ceilings ornamented by rough stucco, the walls hung with carpets or rugs, and seats carved from the rock or earth at the side. The natives belong to the Berber tribes, speaking an Arabic dialect. Tattooing is practiced among the young women, some of whom are quite pretty. The subterranean homes are cool in summer and warm in winter, and the cave dwellers are quite content with their lot. A number of Jewish families were found whose history with regard to the place goes back to the times of the Romans. In Tripoli there are large villages of cave dwellers who are all Jews, and have their subterranean synagogues, their rabbis, and their Talmud schools.



Interior of Cave Dwelling

Subterranean Town in Sahara Desert.

Right, Door of Underground Synagogue

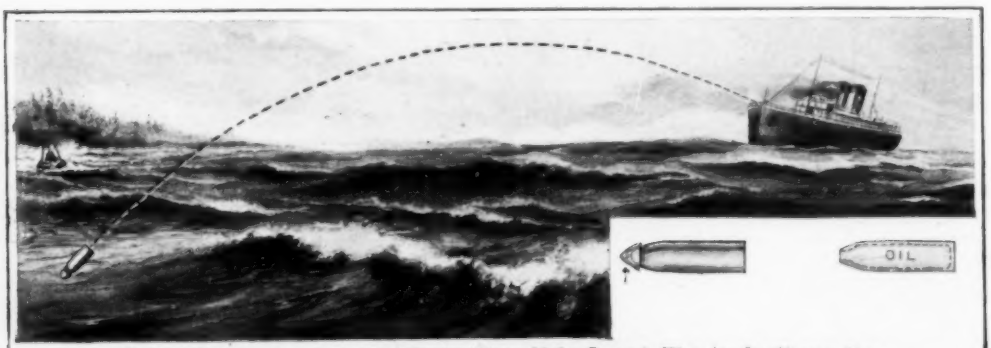


The House of the Sheik

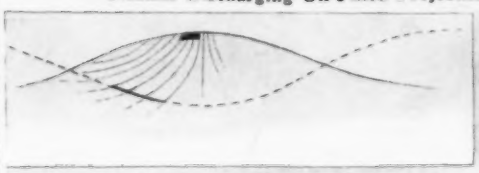
Courtesy Illustrated London News

HOW OIL ON SEA KEEPS WAVES FROM BREAKING

When the oil steamer "Narragansett" came to the aid of the burning liner "Volturno," and by pouring oil on the raging waters made possible the rescue of passengers and crew, interest was again directed to the important part this simple expedient may play in life saving. Few people have a clear conception of the almost miraculous effect a small amount of oil has on wave motion. A drop of oil will spread itself over 7 sq. ft. of water, and 9 pt. of oil are sufficient to cover a square mile of sea surface. The oil film has effect when it is of the thinness of one fifty-millionth of an inch. The British Board of Trade quotes admiralty information in its sailing directions, on "Use of Oil for Modifying the Effect of Breaking Waves." The statement is made that on free waves, that is, in deep water, the effect is greatest. In surf or where waves are breaking over a bar the effect of oil is uncertain. The heaviest and thickest oils are the best. All animal and vegetable oils have very great effect. Oil may be poured over the side of the vessel, may be thrown far ahead by means of a projectile filled with oil, or a buoy may be anchored in any desired spot, from which oil is released when necessary by means of valves operated from shore.

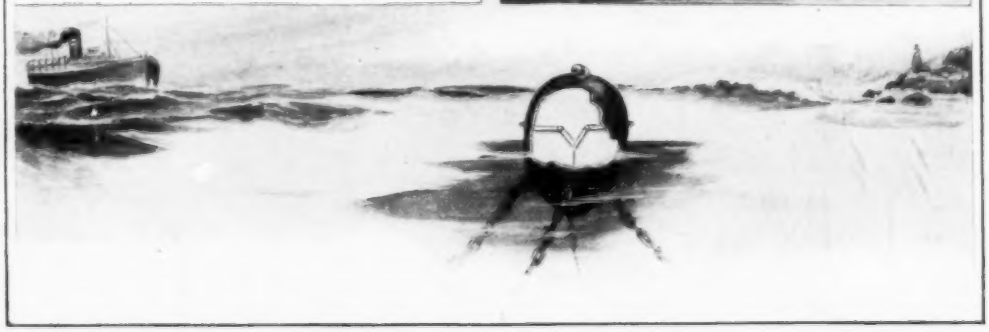


Steamer Discharging Oil-Filled Projectile to Make Smooth Way for Itself over Bar



How Film of Oil Operates on Wave

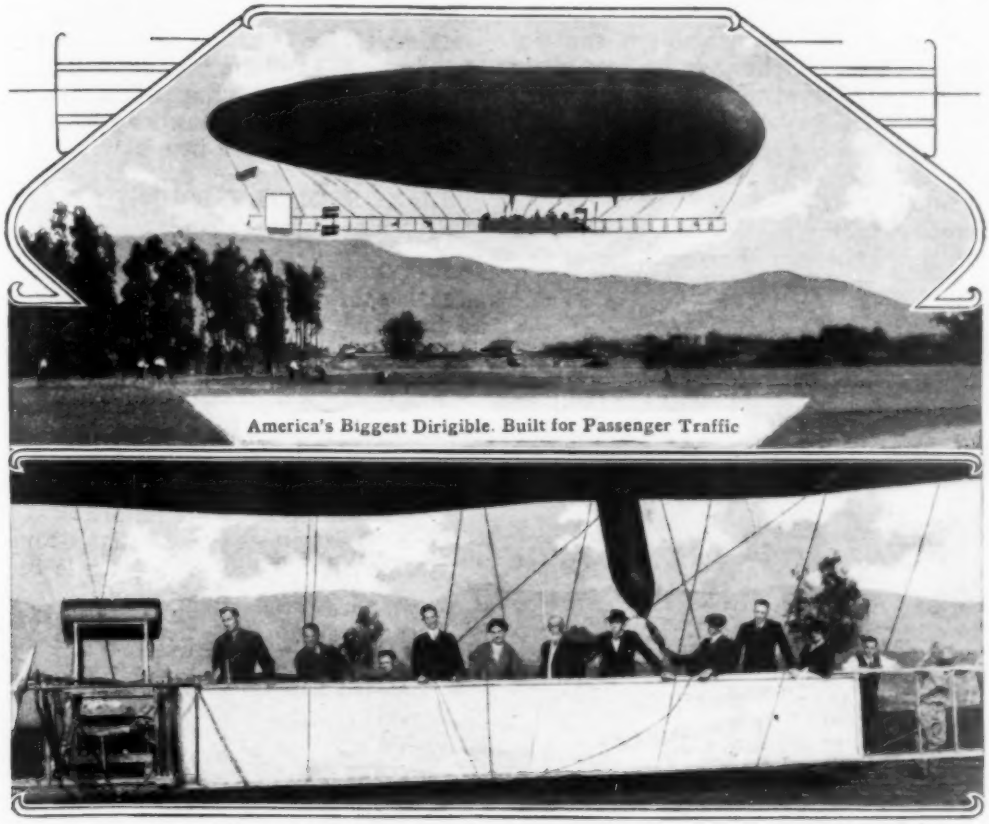
One Drop of Oil will Spread over Seven Square Feet



Oil-Discharging Buoy at Entrance to Harbor Provides Easy Passage for Vessels

Courtesy Illustrated London News

BIG AMERICAN DIRIGIBLE IN PASSENGER SERVICE



America's Biggest Dirigible. Built for Passenger Traffic

A big dirigible balloon, 150 ft. long, with capacity for 12 passengers, is being given a daily try-out in Pasadena preparatory to a regular schedule between that city and Los Angeles, a distance of some ten or twelve miles Carrying from five to ten passengers it has been flying over Pasadena and the surrounding country and has demonstrated its entire safety and control to the satisfaction of its owners and those who have enjoyed the experience of air travel. The airship was built in Pasadena, as was also the 30-hp. engine that is used in it. The big bag contains 75,000 cu. ft. of gas, and with the engine, car and frame attached, it has a lifting power of 2,000 pounds.

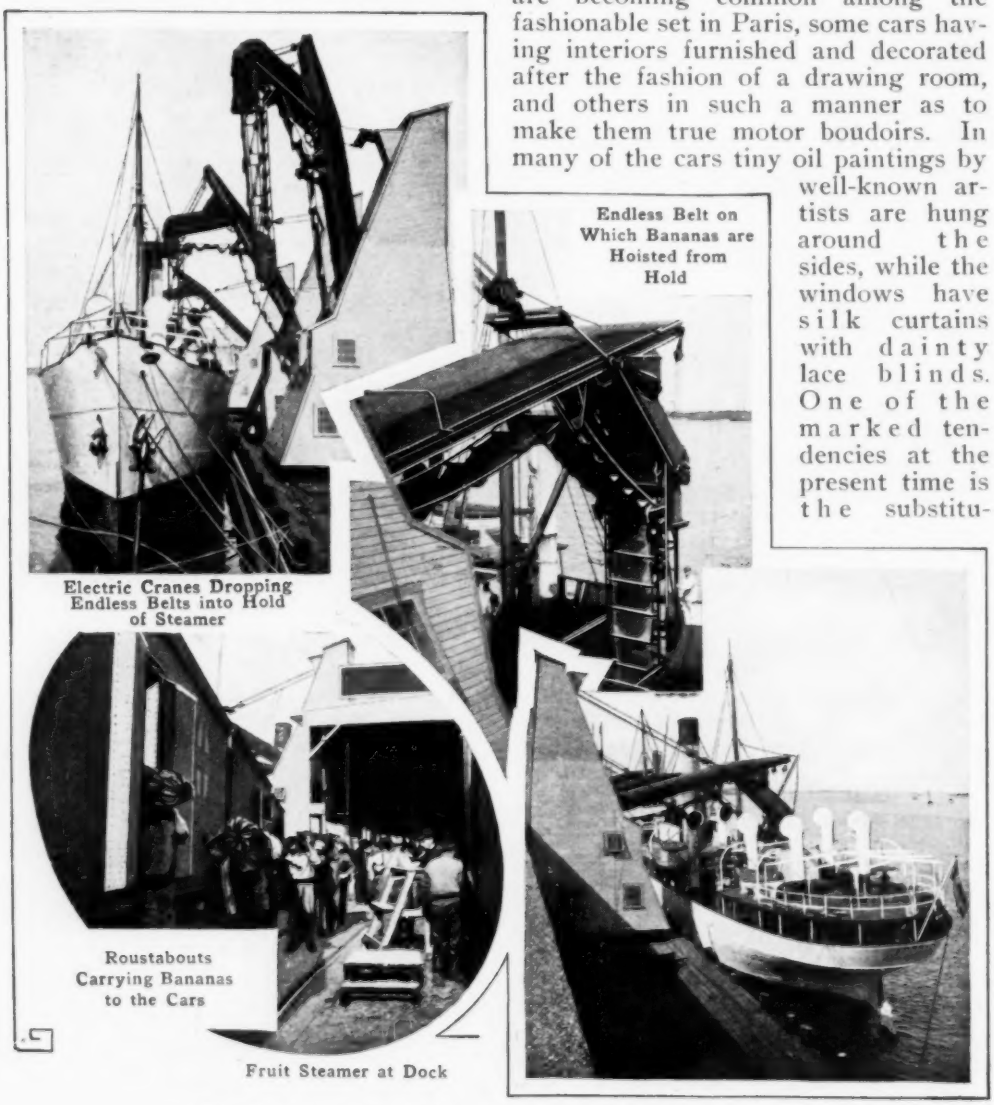
STEEL-CLAD APRONS PROTECT MEN AT EMERY WHEELS

Where heavy castings are ground on high-speed emery wheels the violent vibrations and thumping of the castings against the bodies of the operators result in severe aches and pains, disqualifying employes after a short time. The safety inspector of one foundry has devised a steel and braided-leather apron, made of two thicknesses of sole leather, stuffed with scrap leather and the outside studded with steel rivets, which entirely obviates the difficulty.

¶ On the $10,000,000 contract for dredging Toronto Harbor, all the machinery will be operated by electricity.

HANDLING BANANAS BY MACHINERY

A cargo of bananas, often containing 20,000 bunches, is unloaded in about four hours with the aid of modern machinery. Electric cranes equipped with endless belts drop down the hatches of the vessel the moment it is made fast to the wharf. As the bunches roll from the cranes, men catch them, load them on the shoulders of roustabouts; an expert fruit classifier tells at a glance the grade of the bunch, and directs, by calling a number, the car into which it is to be carried. The bunches are automatically counted and the refrigerator cars, in which they are hung, are removed as soon as loaded, giving way to other cars, quickly shunted into place.


Endless Belt on Which Bananas are Hoisted from Hold
Electric Cranes Dropping Endless Belts into Hold of Steamer
Roustabouts Carrying Bananas to the Cars
Fruit Steamer at Dock

How Bananas are Handled by Machinery at Gulf of Mexico Ports

LUXURIOUSLY FURNISHED MOTOR CARS

Luxuriously furnished motor cars are becoming common among the fashionable set in Paris, some cars having interiors furnished and decorated after the fashion of a drawing room, and others in such a manner as to make them true motor boudoirs. In many of the cars tiny oil paintings by well-known artists are hung around the sides, while the windows have silk curtains with dainty lace blinds. One of the marked tendencies at the present time is the substitu-

tion of gilded armchairs with silk-tapestry coverings for the ordinary leather seats, with footstools to match the seats. Brackets along the walls are provided for holding perfume bottles, powder boxes, lip pencils, and other toilet articles. In some of the larger cars, inlaid writing tables that pull out from the wall have been installed, and on these are to be found books that serve to beguile odd moments of waiting. Flower baskets are in common use, and there is tendency in every detail to make the motor car as comfortable and luxurious as the home of the user.

GREAT PHARMACY IN MOSCOW ESTABLISHED 200 YEARS

What is said to be the largest pharmacy in the world was established over 200 years ago in Moscow. It is known as the old Nikolska Pharmacy and occupies an entire five-story building, furnishing employment to over 200 persons. Only one floor, the second, is open to the public, a marble stairway leading to the large hall. The first floor is entirely given up to prescriptions, the receipts from this source alone amounting to several hundred thousand dollars annually. The third floor contains vaults where the poisons and dangerous chemicals are stored; the fourth floor is devoted to the laboratories and on the fifth floor are libraries, museums, managers' offices, and a lecture hall where members of the faculty of the university give lessons to students in pharmacy.

BEAUTIFUL HANDIWORK OF SOUTH AMERICAN NATIVES

The aborigines of Dutch Guiana are clever workers in fabrics made from native grasses, which have silky fiber and considerable strength. No manual-training schools prepare these dusky children of the llanos and primeval forests to execute intricate patterns whose texture resembles brocaded silk, but their handiwork would bear favorable comparison with the goods displayed in many a northern fancy-goods

South American Indians Clad in Cloth Made from Native Grasses, Resembling Silk

house. They are adepts in weaving the white cotton wool of their country in primitive looms, and form substantial garments, the fringes and borders of which are decorated with cords made from the white silk cotton. This is not unlike real silk, being a trifle softer and not quite so glossy in appearance. The standing figure in the picture wears a garment made from the threads of a certain palm leaf, extremely strong and lasting. All the tools used in preparing these garments are made from wood and stone; the needles are produced from the heart of one of the hardest forest trees, and vary from 2 to 12 in. in length.

AMERICAN SPONGE FISHERIES WORKED BY GREEKS

By LEONORA BECK ELLIS

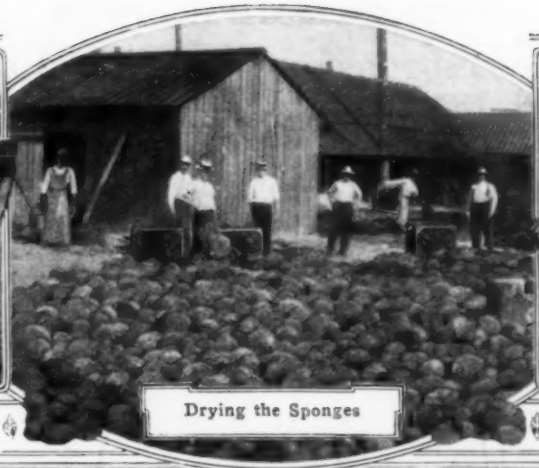
Fifty years ago practically all sponges came from the Mediterranean Sea, but large quantities are now produced in Honduras, Mexico, the Bahamas, and Florida, and the output from the waters of the United States is so great that comparatively few sponges, even of the finer varieties required in surgery and chemical experiments, are imported. Along the Florida west coast sponge fishing is one of the oldest industries, having had its beginning several years before the civil war. From a small industry in which fishing was confined to the shallow waters about Key West, it gradually spread northward along the west coast and out to the better sponge beds in the deeper waters of the Gulf, resulting in a demand for more skill among the sponge fishers and greater investment in sponge craft and equipment. By the year 1892, a fleet of over 100 taut schooners were busy gathering sponges from these waters, pressing as far north as the Anclote River, 50 miles above Tampa Bay, and this activity resulted in the discovery of the most prolific beds in American waters. Key West remained the center of this expanding industry.

But during all this half century the sponge fishers continued to use the clumsy hook-and-pole method of harvesting these valuable marine products. The sponges were torn loose from their bed and brought to the surface by means of three-pronged hooks, shaped like the talons of a bird of prey and attached to long poles. Where the bed of the sea was rocky this method was ineffective, while the fishers were rarely able to work to a greater depth than 35 feet.

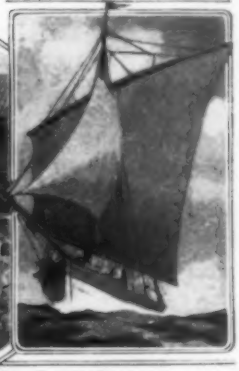
In the past two years a complete revolution has taken place, and this industry is now almost entirely in the hands of Greek fishers. This revolution is the old story of the contest that always goes the same way—the contest between skill and clumsiness, and between adequate and inadequate equipment. The native hook-and-pole spongers had little chance against the trained divers from the Mediterranean, with their diving suits of the latest "cut" and their thoroughly efficient boats and apparatus. The center of this invasion of Greek sponge fishers is at Tarpon Springs. There are now over 3,000 Greeks in this picturesque little town. Many of them have brought their families over, and all have apparently come to stay. Tarpon Springs has become Hellenized—and so has American sponge fishing. The total value of the sponges handled at this point during the year just closed was $750,000, and it is estimated that this will be more than doubled next year, as boats and general equipment are being improved all the time and the number of men employed is increasing daily.

The Caicos Islands, a group that forms the southeastern corner of the Bahamas, also produces a large portion of the world's supply of sponges, the sponge beds being located on a submerged bank which is 50 miles long, 10 miles wide, and from 12 to 30 ft. below the surface. Here the hook-and-pole method is still the most important feature of the industry, but where the bed of the sea is rocky the sponges are obtained by divers who cut the sponges loose with wooden spoons. In the bottom of each boat, protected by a boxlike inclosure, is a sheet of glass through which the fishers examine the sponge bed. At the end of the day the sponges are placed in a position to drain and dry and are left in this position until the animal tissue dies. They are then ready for the "crawls," which are simply rocky inclosures on the sea shore where the dead animal matter is washed out by the tide and the sponges are bleached. Following this, defective parts are clipped off, and the sponges are packed and are ready for the market.

Disappearing under the Water



Drying the Sponges



Greek Sponger under Sail

Greek Sponge Fleet in Harbor on the Florida West Coast

The Landing at Tarpon Springs

Greek Diver Ready to Descend

Interior of a Sponge Warehouse

One of the Favorite Sports of the Divers

WRECKS HIS LOCOMOTIVE TO SAVE THE TRAIN

Running his limited flyer 50 miles an hour, the engineer of a Santa Fe train saw an open switch ahead, as he

Photo by International News Service
What Happened When the Locomotive of a Santa Fe Train Jumped the Track at Joliet, Ill.

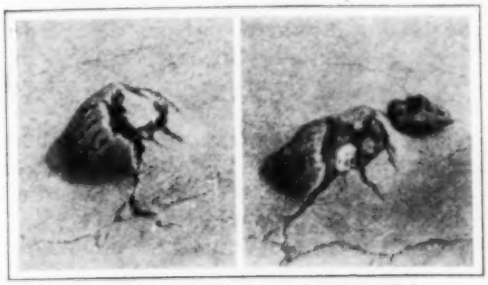
was approaching an overhead street crossing at Joliet, Ill. He threw on his air brakes, then opened his throttle, full speed ahead. The locomotive, tender and an unoccupied baggage car leaped over the embankment, the coupling between the first and second baggage cars giving way, while the passenger coaches were checked on the brink of the wall. When the startled train crew and passengers hurried to the overturned engine, the engineer was found, unconscious but alive, his hand still grasping the throttle. The photograph was taken as the wrecking crew was lifting the unoccupied baggage truck back on the track.

¶West Virginia is the greatest producer of natural gas in the country, the output for 1912 being 240,000,000,000 cubic feet.

THE POWER EXERTED BY GROWING PLANTS

The remarkable force exerted by growing plants, capable of overcoming almost any obstacle hindering natural growth, has often been illustrated by the ease with which tree roots disrupt sidewalks and curbs. They have been known to raise boulders weighing 18 tons and there is a record of a sapling that grew through the hole in a millstone and carried the stone into the air. In addition to the natural cell pressure of several atmospheres, mechanical hindrance seems to act as a stimulus resulting in incredible strength. A squash, harnessed to a lever in one experiment, succeeded in raising a 5,000-lb. weight. The squash itself grew to weigh 47½ lb. and developed about 80,000 ft. of roots in the 80 days of the test. In many instances mushrooms have grown through hard-tar sidewalks, 2 or 3 in. thick, and ostrich ferns have ruptured solid, brittle concrete, as if it were putty. Three large mushrooms have been known to raise an 80-lb. flagstone and a subsequent examination of the plants showed no signs of damage or scars on their tender surfaces. Attempts to reproduce by

means of levers the steady pressure exerted by the plants in growing through concrete walks show that a



Mushroom Forcing Its Way through a 2-In. Concrete Walk

force of 262 lb. is required to break through a walk in the 10 days used by ferns, and 189 lb. in the 13 days required by mushrooms. A calculation of the area of the concrete surface affected shows that each plant exerted a pressure of from 525 to 750 lb. The manner in which the concrete breaks under the pressure of a mushroom growing underneath is illustrated by two photographs on this page.

PHOTOGRAPHING CONTENTS OF SEALED ENVELOPE

A British scientist has succeeded in adapting X-ray processes to the photographing of very thin substances, such as a sheet of paper, a leaf or an insect's wing, through which, under former methods, the rays passed without making any impression. Letters written on an ordinary sheet of paper were sealed in envelopes and radiographed by means of "low" tubes, giving out "soft" rays, and the negative showed the words inscribed in the letter clearly, although they had been written in common ink. The details were all clearly defined, the edges of the piece of paper and the gum on the flap of the envelope showing plainly. By this means it is possible to ascertain the contents of important letters and sealed documents without leaving any evidence of tampering.

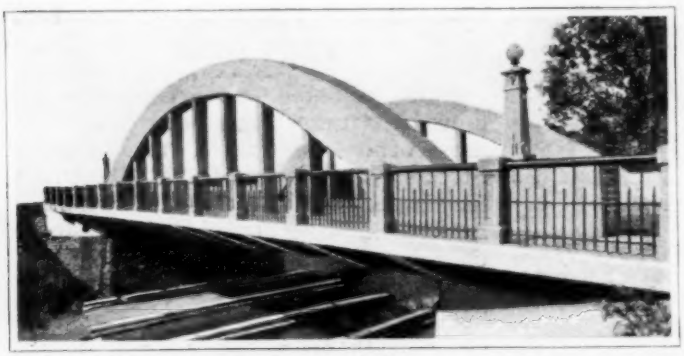
BLOCK OF STORES ONLY SIX FEET DEEP

Built of steel and concrete, an unusual structure has been erected at the corner of Carrell and Pender Streets, Vancouver, B. C., 95 ft. in length and only 6 ft. deep. It is a business block, being occupied by six stores on the street level and two suites of offices on the second floor, while the basement contains a restaurant, with kitchen, lavatories, etc. The stores have windows which open up so that customers may be served from the street by the proprietors. The inside dimensions of the stores are 13½ by 5 ft.; the offices are 42 ft. long and 7½ ft. wide, the overhanging balconies giving additional space. The restaurant is given room by extending it under the sidewalk, light being secured from glass set into the pavement. This extremely narrow building was made necessary when the city widened Pender Street, taking 24 ft. off a 30-ft. lot. A difference of opinion regarding the value of the remaining portion led to its use as a store building by the owner.

One of the Shallowest Buildings in the World

CONCRETE BRIDGE WITH SUSPENDED FLOOR

A bridge of reinforced concrete offering some new features has been erected in Ohio between the little towns of Lockland and Reading. The concrete floor is suspended from reinforced-concrete arches, no structural steel being used. Beneath are water guides of concrete placed in the bed of the stream to make the water run parallel with the façade of the abutments and without swirling motion during flood times. The bridge is nearly 200 ft. long, and has a roadway 25 ft. wide, with a 6-ft. sidewalk on either side.



Substantial Bridge of Reinforced Concrete of New Type

UNIFORM ROAD RULES FOR AUTOMOBILES

A circular has been sent by the Automobile Club of Germany to affiliated clubs in other countries seeking to enlist their aid in securing the adoption of uniform road rules for all countries. Vehicles turn off in meeting to the left and pass from behind to the right in England, Luxemburg, Portugal, and Sweden, while in all other countries the opposite rule obtains.

¶The number of establishments in this country engaged in the manufacture of electrical machinery and supplies is about 1,100, furnishing employment to about 110,000 persons.

SPOIL MEMORIAL BELL TO SAVE HUMAN LIFE

A huge temple bell, being cast in Japan for a memorial to Emperor Meiji, was ruined when the engineer in charge shut off the flow of molten metal to save employes from possibly fatal injuries. Water from a conduit leaked into the mold, causing an explosion when the casting was nearly completed, and the crucible was closed before the entire melt had run. When the mold was opened three days later the bell was found to have no neck by which to suspend it, the charge being shut off too soon for the metal to reach the head of the casting. The association which undertook to promote the memorial has decided to recast the bell entirely.

NOVEL CASE OF TREE SURGERY

Two years ago mice girdled the young trees in a Maine orchard so badly that they seemed beyond hope of recovery. An orchardist from the Maine Experiment Farm succeeded, however, by means of bridge grafting, in restoring most of the trees to health and strength. He took some live branches from other trees for scions, and in the usual way spliced one end into the main root of the tree and the other beneath the bark above the girdled zone. This was done at two opposite points of each tree, and in the two

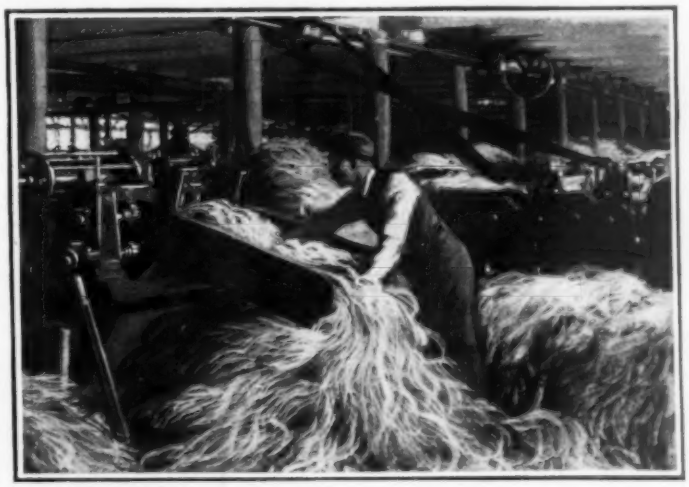
years which followed, only three of the trees so treated died, while the others are bearing bountifully.

BIRD MUSCLES AND AERONAUTICS

A French investigator of bird flight has made a study of the muscle and heart development of birds in relation to total weight; or, in terms of aviation, the relation of the motor equipment of birds to their weight. It is interesting to note the extent of difference in the proportional weight of the muscles and heart of the two types of birds. The pectoral or breast muscles of the night hawk, which is a "planing" bird, comprise 10.5 per cent of the total weight, and the heart .07 per cent, while for the type of birds that fly by flapping the wings, such, for instance, as the common domestic fowls, grouse, quail and the like, the corresponding figures are 26.37 per cent and 1.34 per cent respectively.

NATURAL BEAUTY OF CANAL TO BE ENHANCED

Although the Commission of Fine Arts has found the Panama Canal devoid of ornament and with no evidence of the esthetic in the architectural features of the construction work, it does not minimize the natural beauties of location, the tropical foliage, the broken skyline and the glimpses of ocean, lake and bay through the purple haze. The commission has outlined a plan for the erection, at suitable points along the canal, of monuments and arches, commemorative of the completion of the project, which, it is urged, shall give a touch of the esthetic to an otherwise crude, although impressive, engineering feat. A monument 100 ft. high is proposed for Culebra, where the canal passes through the continental divide, and another at Gold Hill, the highest point in the Culebra Cut, and some suitable structure in the form of an arch at the point where the channel from Limon Bay ends and the canal actually begins, with a replica at the Pacific end.



Making "Sliver" or "Roping," the First Mechanical Process in the Manufacture of Rope

MUCH CARE NEEDED IN MAKING ROPE

The process of making rope is a comparatively simple operation, but the manufacture of the best quality demands close attention to each of the little, but important operations involved in the process. The raw hemp is first fed into machines that form the "sliver" or strand. Steel pins attached to a moving endless chain catch the mass, while another set of pins pulls out the fibers, one by one, and combs them into the proper form for feeding into the other machines. One of the most important of the preparatory processes of rope making is the softening of the hard fibers with oil, which is usually applied immediately after the machines have combed out the snarls, loose tow, and dirt. The best hemp for rope comes from Manila.

EVERY LITTLE TREE HAS A FURNACE OF ITS OWN

Protecting orange trees from frost has been a strenuous task. "Smudging," by building crude-oil fires to the windward, covers both fruit and foliage with a black, dirty coating, but a new heater has been invented intended to do away with this difficulty. It consists of a sheet-iron cover, with appropriate perforations about 2½ ft. high. It is some 14 in. in diameter at the bottom and 6 in. across at the top. A grate fits in this device, several inches from the bottom, and on this a stove, burning crude oil, is placed. A heater is placed near the trunk of each tree and the heat rises into the foliage, raising the temperature and maintaining it above the freezing point. No sooty deposit is noticed, and while a little more expensive at the start than smudging, this individual-furnace method is considered cheaper in the end.

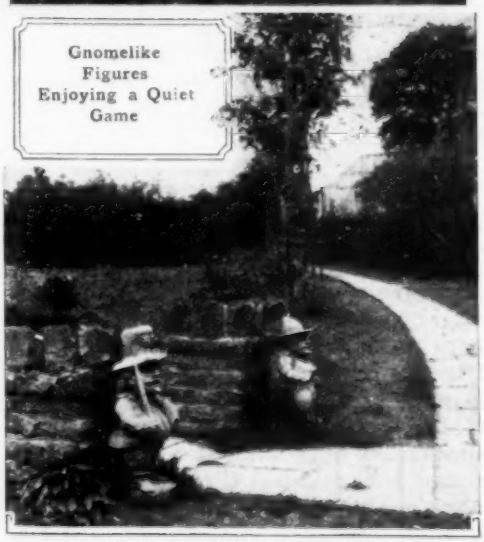
ARTESIAN WELLS FURNISH HYDROELECTRIC POWER

An enormous artesian basin underlies a large part of Queensland and the northwest portion of New South Wales, in Australia, and in Queensland alone there are nearly a thousand artesian wells. These wells were originally driven to supply water for irrigation and other purposes, but it has been found that the pressure of water coming from some of them is great enough to furnish power for running hydroelectric machinery. At Thargomindah there is one well having a jet that develops, theoretically, 6,500 kw., after allowing the necessary losses of transformation. Turbines and dynamos have been installed and the town is now lighted by current secured from this source.

QUAINT STONE FIGURES OF OLD-WORLD GARDENS

Four gnomelike figures engaged in a game of cards and two dwarfs guarding the entrance to the grounds, form one of the quaint garden features of the Hilder estate at Ingatestone, England. These figures are all in stone, and were brought from the royal residence at Hampton Court. At one time such figures were a common feature of old-world gardens, but they are now exceedingly rare.

Gnomelike Figures Enjoying a Quiet Game



Two Stone Dwarfs Guarding the Entrance

MOTOR TRUCK CROSSES ALASKA

Engineers and army officers motored to within 2 deg. of the Arctic Circle last summer in a 1,500-lb. truck of the standard design already used in the United States army. The trip was undertaken primarily to demonstrate the practicability of motor transportation in Alaska, but the result showed a route which saves at least one month in the time required to reach the larger interior towns, particularly those on the upper Yukon, and the headwaters of the Tanana River. The truck left Valdez with a load of supplies and a quantity of mail for camps along the military telegraph line. Considerable mail was carried to points where none had been received for a year. The trails, some of which had been opened by the Alaska Road Commission, were scarcely adapted to motoring, being in some cases corduroy trails, in others merest bridle paths which had to be blasted and graded before the heavy truck could pass. In all, 826 miles were negotiated in 19 days.

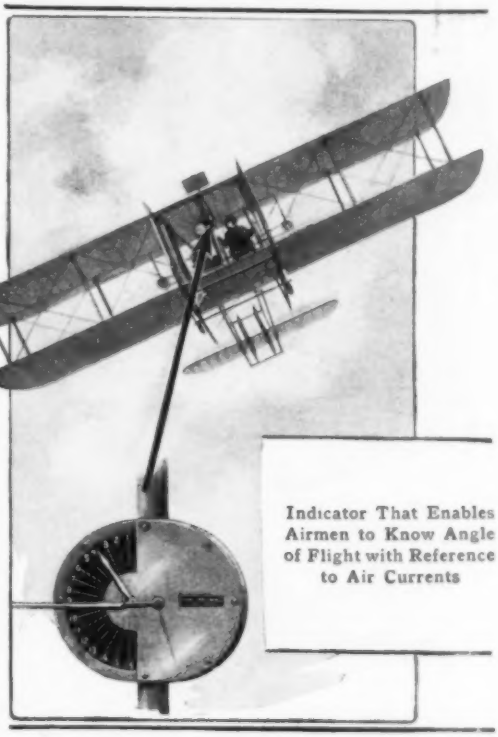
ACETYLENE LAMPS KILL INSECT PESTS

In the vine and fruit-growing districts of France and Germany insect pests often menace the harvest, and recently it has been found that acetylene lamps are valuable in destroying them. A number of lamps are lighted, attracting the insects which fly into the bare flame, singeing their wings. Circular troughs are provided, filled with water and covered with a film of petroleum, into which the insects fall, and by which they are killed.

¶More than 99 per cent of Alaska is owned by the government, and this vast area was bought by the government for less than two cents an acre. For developing the territory, about 10,000 miles of railroad will be required.

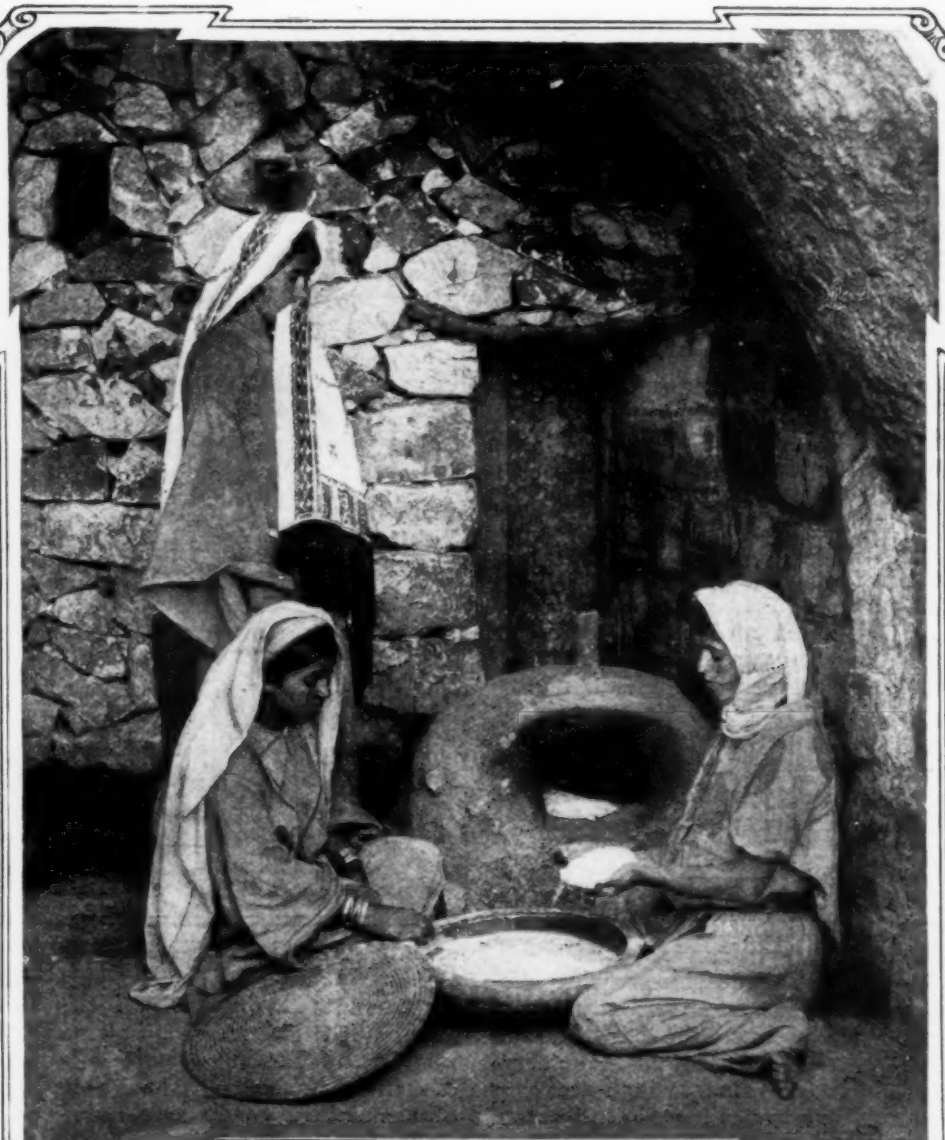
NEW ANGLE INDICATOR AN AID TO AIRMEN

An angle indicator has recently been brought out which is designed for the use of airmen, and which shows at all times the exact angle of the aeroplane with reference to the air currents through which it is moving. With this device an airman who knows the limiting range of angles of his machine can always be sure of remaining within safe flying positions, and in this way avoid the dangers of climbing or diving at too steep an angle. The particular value of this indicator is that it shows the angle with reference to the air currents, which are not always horizontal, and which determine the position the planes should take. The indicator consists of a light air vane which operates a pointer on a dial and which is so made that it is not affected by the force of gravity, thus making it superior to the usual clinometer, which is uninfluenced by air currents.



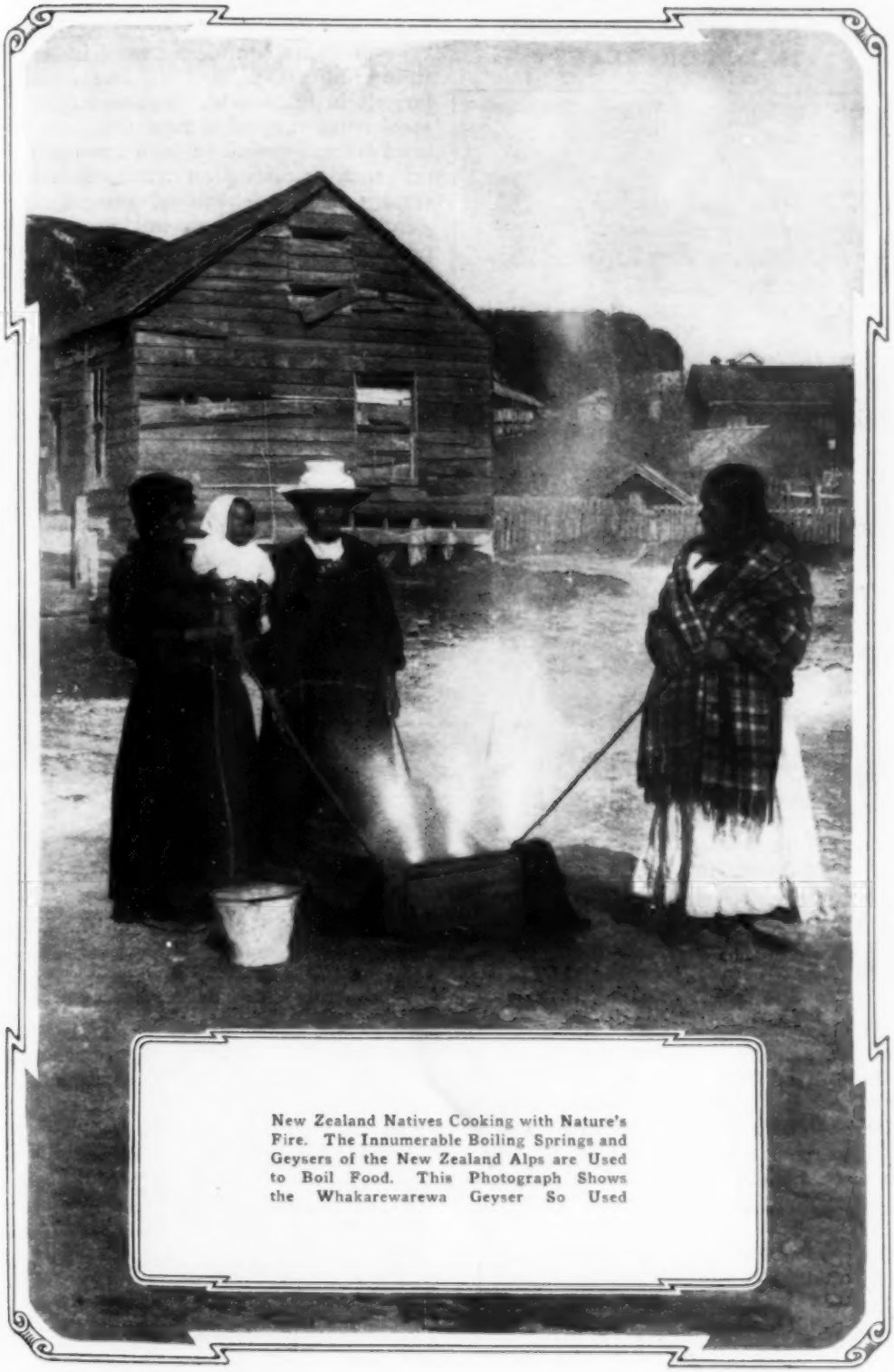
Indicator That Enables Airmen to Know Angle of Flight with Reference to Air Currents

THE FIREPLACES OF ALL THE WORLD—I



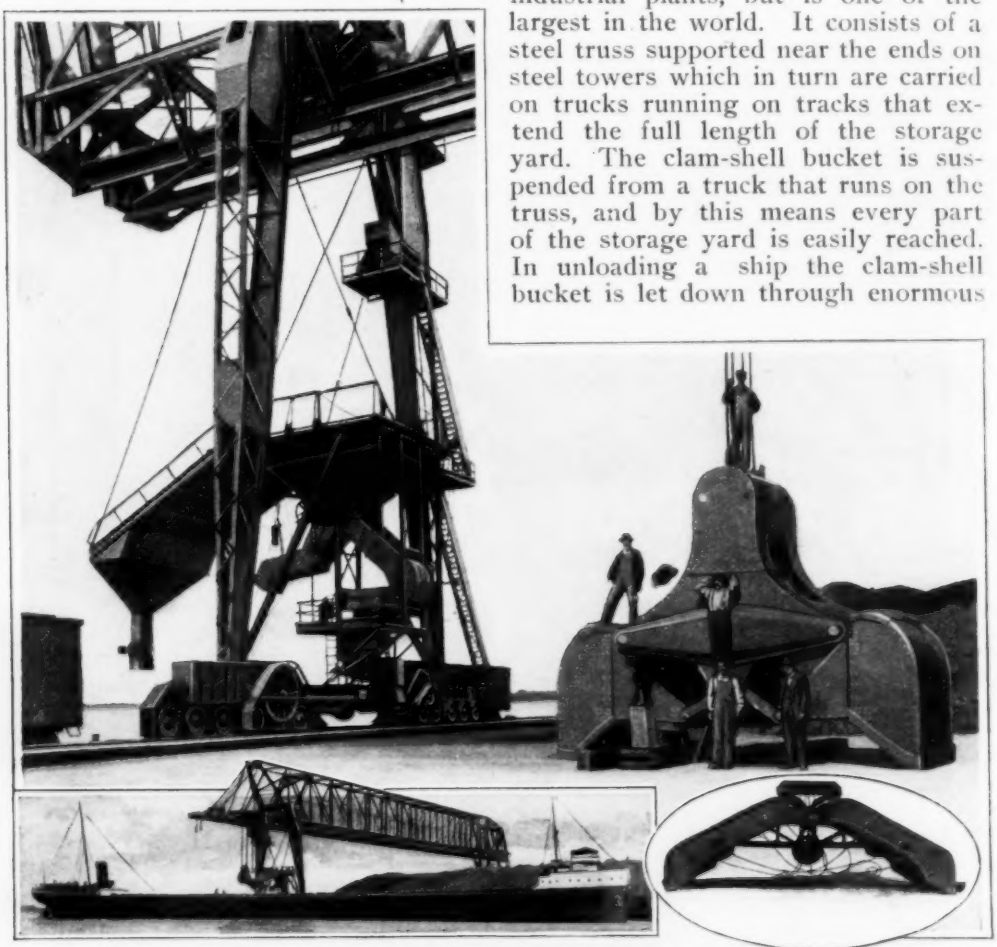
Bread Makers in the Courtyard of a Syrian Home. Here the Most Primitive Form of Oven is Still in Use, Differing in No Important Respect from the Ovens of the Ancient Chaldeans

THE FIREPLACES OF ALL THE WORLD—II



New Zealand Natives Cooking with Nature's Fire. The Innumerable Boiling Springs and Geysers of the New Zealand Alps are Used to Boil Food. This Photograph Shows the Whakarewarewa Geyser So Used

A LAKE SUPERIOR COAL-HANDLING PLANT



Traveling Crane Used in Unloading Coal from Ore Ships at Lake Superior Port

The Seaward End of the Traveling Crane

Bucket That Picks Up 12 Tons of Coal at One Time

The "Trimmer" Bucket Used for Cleaning the Hold after Bulk of Coal has been Taken Out

Coal-handling equipment of enormous capacity is required at the ports at the head of Lake Superior, to which the big lake freighters, after taking a load of ore from the mines in that region to Buffalo, return loaded with coal destined for distribution throughout the Northwest. One of the biggest of these installations is at Superior, Wis., where the largest clam-shell bucket in the world, capable of lifting over 12 tons of coal at one time, is in use. This bucket is suspended from a traveling crane which is 130 ft. high and has a span of 710 ft. This is the type of crane commonly used in large industrial plants, but is one of the largest in the world. It consists of a steel truss supported near the ends on steel towers which in turn are carried on trucks running on tracks that extend the full length of the storage yard. The clam-shell bucket is suspended from a truck that runs on the truss, and by this means every part of the storage yard is easily reached. In unloading a ship the clam-shell bucket is let down through enormous hatchways, picks up the coal directly from the hold, and is then run out over the storage yard and dumped. For cleaning up the hold after the bulk of the coal is taken out, the "trimmer" bucket shown in the illustration is used. With this equipment a 10,000-ton ship is unloaded in about 20 hours.

¶An allowance of one elevator for each 15,000 sq. ft. of rentable area is the usual practice in planning office-building equipment.

ELECTROLYTIC BATH USED IN LEAD POISONING

An interesting case was related to the Royal Institute of Public Health in London recently where a workman suffering from lead poisoning was placed in an electrolytic bath for treatment. After three or four baths the morbid symptoms disappeared, while lead was found in the water and on the electrode. If the method is found successful in general application, lead poisoning will lose its terrors.

HIGH-SCHOOL BOYS BUILD SCHOOLHOUSE

The boys of the manual-training department of the Fullerton, Cal., high school built a small schoolhouse to accommodate an overflow of pupils in the local grammar school. As shown in the picture, the building has no windows, the light entering through open spaces in the side which are covered with wire netting. The upper portion of the schoolhouse is covered with canvas, the lower portion boarded and sheathed as usual in frame buildings. The roof is thatched with palm leaves, and the cost of the entire building was $50, accommodating 60 pupils. In the summer time the house is always at a comfortable temperature, and windows and a small stove are put in during the cold season.

An Overflow Schoolhouse That Cost $50

GLASS THAT CRACKS BUT WILL NOT SPLINTER

Serious wounds in automobile accidents sometimes occur through cuts received from splinters of glass. A

Very Severe Blow Fails to Splinter Glass

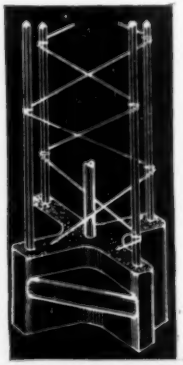
material for windows and windshields has been brought out in Europe, consisting of two layers of glass between which a celluloid layer is hydraulically pressed. The picture shows the effect of a very severe blow on this new glass, cracking it badly but without producing splinters. Besides its high resistance powers, the new glass is sound-proof, making it of value in construction of office and business buildings as well as in motor-vehicle construction.

NAVY MAN FLIES 40 MILES WITHOUT USING HANDS

While trying out a gyroscopic stabilizer for an aeroplane, Lieutenant Bellinger of the United States navy recently flew from Hammondsport, N. Y., to Penn Yan and return, a distance of 40 miles, without using the manual controls. Hundreds of flights were made during the recent series of navy tests.

CONCRETE TROLLEY POLES OF NEW DESIGN

Concrete telephone and trolley poles of a new design which makes them strong and flexible and at the same time unusually light in weight are now being built. The new patented pole differs from other monolithic concrete poles in that its section is neither square nor round, but in the shape of a cross. It has four flanges projecting from a square central core, all cast in one piece and reinforced with iron rods and webs. Cross ribs, connecting the corner flanges at short intervals, give additional strength and furnish steps for climbing. Holes are provided near the top of the poles for cross-arm bolts. A 30-ft. pole, weighing only 1,900 lb., is as strong as wood or solid concrete.



30-Ft. Concrete Trolley Pole of New Design, Supporting a Load of 800 Lb., and Cross Section Showing Reinforcing

WORLD'S SAFEST PLACE IS IN A RAILWAY CAR

While railroad accidents are all too frequent, it is nevertheless true that when the vast number of journeys undertaken are considered, the safest place in the world is in a railway car. A New York statistician has estimated that the average length of the railway journey in New York state is 34 miles, and that 2,275,122 such journeys are made in safety to each journey which results in a fatal accident. A man who started out to ride these 2,275,122 trips at the rate of two a day, should prepare himself for continuous commuting for 3,792 years. In other words, in order that he might meet his death in a railway accident during 1914, he must have started traveling in 1878 B. C.

IMPROVING THE AMERICAN SARDINE INDUSTRY

In an effort to reëstablish and improve the American sardine industry, which, on account of destructive competition, has fallen to a low state in recent years, the Department of Agriculture has established an experiment station at Eastport, Me., where a thorough study will be made of the fish caught in the Maine sardine waters and the best methods of packing them. The new laboratory has already discovered one important point in the packing process which causes considerable loss. The Maine packers pack as large fish as they are able to get into a box, and to make the fish fit the cans, the head, a small part of the tail and from $\frac{1}{8}$ to $\frac{1}{4}$ of the best part of the fish is cut off with a pair of scissors. To eliminate this loss the whole subject of economical packing will be carefully studied.

USE OF DIESEL ENGINES ON SEAGOING SHIPS

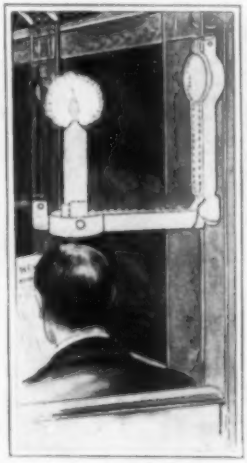
The use of the Diesel internal-combustion engine, which operates with crude oil as fuel, for the propulsion of ocean-going vessels, is increasing rapidly. There are 12 such vessels now in commission, and more than 25 others, of varying tonnage, are now being constructed in European shipyards.

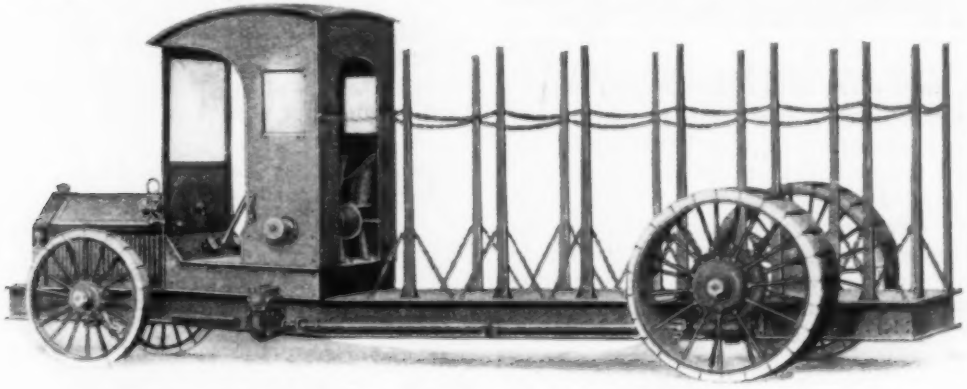
NEW LOW-PLATFORM MOTOR TRUCK

Through the elimination of axles and springs a motor truck which has just appeared is made very rigid and carries its load close to the ground. The loading platform, made of steel channel beams and I-beams with a boiler-plate floor, is only 21 in. above the ground and has a clearance of 11 in. The motor and cab are carried on a separate framework mounted on three suspension points, one point of which is a spiral spring to take up vibration. This subframe with the power plant can be removed for repairs and another substituted so that the chassis need not be idle. Power is transmitted through a jackshaft and two main shafts mounted within the channels of the outside frame beams; worm gears are used at the junction of the shafts and on the rear wheels. A loading winch in the cab can be thrown into gear with the engine.

NEW EMERGENCY LIGHT FOR ELECTRIC-LIGHTED CARS

When cars, railroad or motor, are dependent upon electric lighting an auxiliary system is necessary for use in the event that the primary light is impaired or destroyed. This, reduced to a simple unit, is provided in a European invention illustrated herewith. A metal case, hinged at the lower end, holds securely a candle which may be instantly lighted if the electric light fails. When not in use the case folds up out of the way.





New Motor Truck Which Has No Springs or Axles

GERMANY ADDS TO WORLD'S SUPPLY OF PLATINUM

Through the discovery of platinum in large quantities at Wenden, a village in Prussia, it is expected that the world's supply of this valuable metal will be greatly increased. Platinum is now the most valuable of all metals which have industrial use. It is heavier than gold and sells for about twice as much. Its greatest value lies in its heat-resisting qualities, in the fact that it cannot be oxidized and that only aqua regia will dissolve it. Smelting crucibles for laboratory use are almost exclusively made of platinum. Heretofore the supply of this metal has come mainly from the Ural Mountains in Russia, but it has been found in smaller quantities in Peru, Colombia, Borneo, and California.

TERRACED WATERCOURSES OF THE ALPS

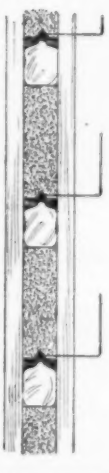
Many of the watercourses in the Alps of southern France have been terraced with a series of small masonry dams

A Watercourse in the Alps, in Which Erosion is Reduced by a Series of Small Masonry Dams

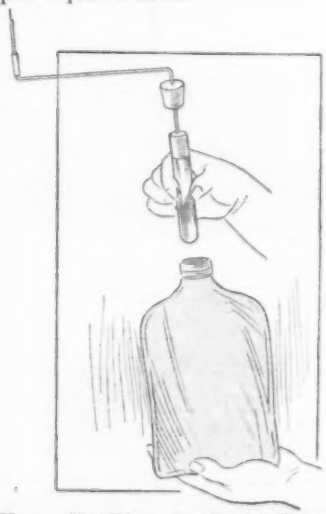
so constructed and located as to control the flow both at high and low water, and this method is meeting with success as a means of flood control. These dams are effective not only in limiting the flow, but serve to minimize erosion in the steeper watercourses by breaking the fall into a series of smaller falls, thus robbing the water of its destructive force.

APPARATUS FOR MEASURING PRESSURE OF CONCRETE

For finding the actual weight that the different parts of a form used in the construction of concrete columns will have to resist, a new and apparently reliable apparatus for measuring the pressure of the wet concrete has been developed. The importance of this apparatus lies in the fact that it furnishes exact data so that the builder can make his forms of the required strength without the risk of wasting material in making them excessively strong. The apparatus is simple, and is in effect an improvised mercury barometer. Ordinary hot-water bottles filled with water and located at vertical intervals of about 3 ft. are placed in the test column as it is being poured. Each hot-water bottle contains a test tube nearly filled with mercury and held in a vertical position with the open end up, and into this tube is inserted the open end of a graduated glass tube which passes through the rubber stopper of the hot-water bottle and is bent in such a way as to pass outside the concrete column so that readings can be made. The pressure of the concrete on the hot-water bottle is transmitted through the water to the mercury, and this in turn is forced up in the graduated glass tube to a height corresponding to the pressure of the concrete. The glass tube is marked with graduations in advance of the test by means of preliminary experiments that show how much the mercury rises for different pressures. The pressure in inches of mercury which is obtained by this means is, of course, readily translated into pounds per square inch.



Arrangement of Hot-Water Bottles in Concrete Test Column

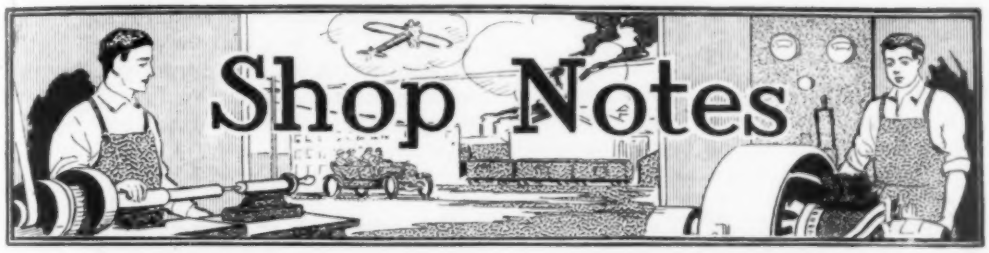


Hot-Water Bottle with Glass Tubes Used in Measuring Pressure of Wet Concrete

¶There are 10,466 merchant vessels sailing salt water registered at Lloyds.

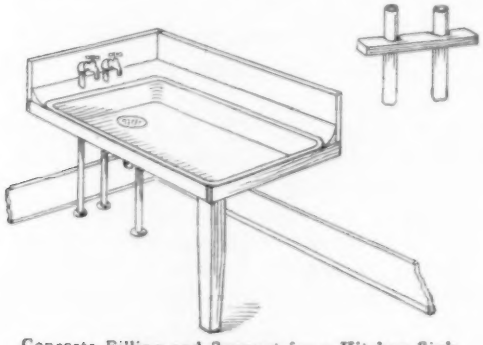
heavier than gold and sells for about

bia, Borneo, and California.



Setting a Kitchen Sink with Concrete

In removing an old galvanized-iron sink to replace it with a new white-enameled one it was found that the boards covering the rim had rotted so that they could not be used. A more sanitary plan than replacing the decayed boards with new ones was desired, and as concrete was suggested, we proceeded to carry out the idea with gratifying results. The hot and cold-water pipes were first firmly anchored to the wall behind by means of a board notched out to fit them. Where necessary other light boards were fastened for a form to hold the concrete. The new sink was then set in place over the bare framework and the concrete poured in. The concrete consisted of a rich mixture using about equal quantities of cement and as fine sand as was possible to obtain. This mixture would smooth up nicely and when worked with the back of a spoon, to

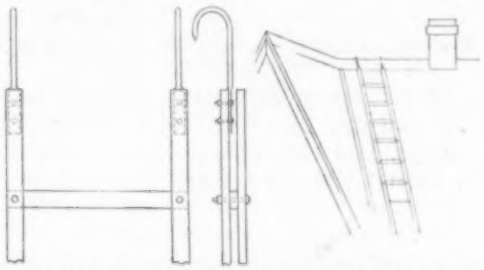


Concrete Filling and Support for a Kitchen Sink That is Sanitary and Bug-Proof

form the gentle curve between the splashboard and the inner edge of the sink, and painted it proved a highly satisfactory job.—Contributed by Mrs. Paul S. Winter, Greenville, Pa.

An Adjustable Folding Ladder

While trying to paint the roof of my bungalow I found that the pitch was too great to walk upon comfortably,



An Adjustable and Folding Ladder to Fit Any Slope or Angle of a Roof

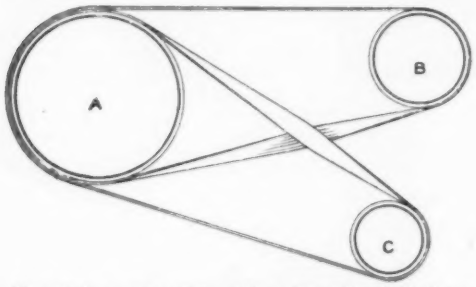
and this caused me to devise the ladder shown in the illustration. A ladder of any length can be made on the same principle. The materials necessary are 2 hooks, 2 bolts for each rung, and sufficient lumber, 1 in. thick and 2 in. wide, to make the length of ladder desired.

The uprights consist of two pieces, separated to admit the rung material. The rungs are placed at the proper intervals between the sidepieces, and a bolt is run through them and the end of the rung. The nuts of all bolts, including those in the hooks, should be on the same side. If this ladder is properly made, it can be adjusted to any angle of the roof and also folded for carrying or for storage.—Contributed by R. R. Williams, Colchester, Illinois.

¶Grease stains may be removed from cloth with benzine, ether, chloroform, or carbon tetrachloride. The latter is noninflammable and is, therefore, the safest to use.

Two Pulleys Driven by One Belt without Idler

The illustration shows a way of driving two smaller pulleys from one wheel by means of one belt without an

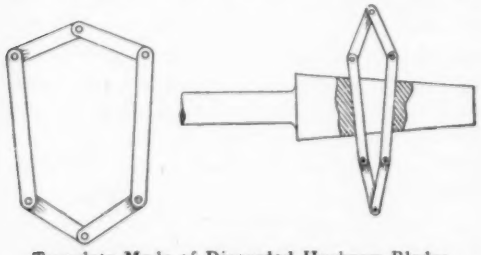


One Belt on One Driver Runs Two Small Pulleys without an Idler between Them

idler for the purpose of securing the required arc of contact on the small pulleys. The belt is placed on the driver A, then twisted as a crossed belt between the pulleys B and C, and passed over them in the manner shown. This will produce the effect of running two belts on A, one over the other.—Contributed by James E. McCormack, Haliburton, Ont.

Adjustable Template for Making Taper Keys

The making and fitting of taper keys is usually guesswork, as there is no means of accurately ascertaining the taper of the slot, for instance, in a piston rod. The sketch is descriptive of a simple jig that will be found quite efficient for this work. I made one of discarded hacksaw blades, 6 in.



Template Made of Discarded Hacksaw Blades for Obtaining the Shape of a Taper Hole

long. When the jig is placed in the slot and spread to the inside faces of the ends it affords a perfect template to lay off the key for machining. The length of the key can be marked lightly with chalk on the template, allowing no chance for a mistake nor for waste of material.—Contributed by F. W. Bently, Milwaukee, Wis.

Cleaning Iron of Burned and Caked Grease

In cleaning molds or iron ladles that have grease burned and caked on them the following solution works well. A few ounces of potassium dichromate is dissolved in water. The article to be cleansed is placed under the surface of this solution, and then 1 oz. of commercial sulphuric acid is slowly added. Never pour the solution into the acid, but always pour the acid slowly into the water after the article to be cleansed is in position. This gives off a gas that attacks the burned grease and removes it. It is also good for cleaning kitchen pans that are caked with grease or black carbon. The solution should be placed in a glass jar for future use. It is harmless, but must be kept from the hands or clothing, as it burns and discolors the skin and removes the color from cloth and causes holes. The articles are left in the solution a short time and then washed and dried.

Painting Figures on the Dial of a Gauge

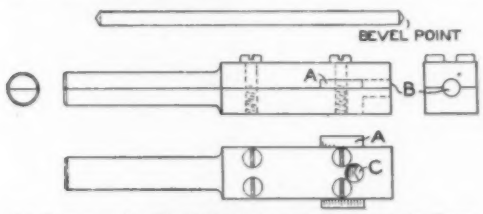
The paint or enamel figures on a steam-gauge dial will in time become almost invisible, because of the effect of the heat from the boiler which dries the paint, causing it to crack and drop off. The figures on these dials are first stamped in with steel dies and the sunken portion filled with enamel or paint.

A good way to recolor them is to daub the paint well down into the sunken figures, paying no attention to the paint that is apt to get on the dial face. After painting, take a piece of heavy cardboard and press its edge to the surface of the dial to wipe off the

surplus paint. The cardboard edge cannot touch the paint in the sunken portions, and the figures will show up in full color, while the face of the dial will be clean and bright.

Pointing Rod Ends

Where it was necessary to bevel-point the ends of several thousand pieces of cold-rolled steel rods, each 6 in. long, true and concentric with the stock, a special tool for doing the work had to be constructed. This tool was made of two pieces of metal, ¼ in. thick and ½ in. in width, secured together as shown and having the ends centered and a $\frac{5}{16}$-in. shank turned on one end. Then a slot, $\frac{3}{32}$ in. deep and ⅜ in. wide, was cut in one member, to admit the cutter A, which was held in place by the fit and two screws. The hole B was made the size of the

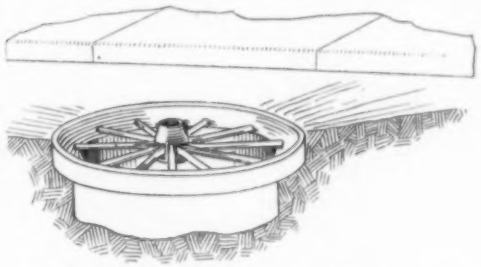


An Inexpensive Tool Used in a Drill Press the Same as a Drill for Pointing Rod Ends

rods and the hole C was drilled for clearance of the chips. The beveling edge of the cutter is plainly seen in this hole. The tool was held in a drill-press chuck and fed on the ends of the rods in the manner of drilling holes. The tool can be taken apart for sharpening. It was inexpensive and did its work quickly and satisfactorily.—Contributed by Donald A. Hampson, Middletown, N. Y.

Wagon Wheel Used for Grate over Sewer Opening

In a small village the problem of constructing an inexpensive sewer drop was solved by the mayor in the manner shown in the sketch. The spokes of a discarded wagon wheel were sawed off about 10 in. from the hub and the hub part set into the flange of a vertically placed sewer tile. This is a very efficient grate as it stops all drift-wood, twigs, leaves, and other solid ob-



The Hub and Spokes of a Wagon Wheel Forming a Grate Covering for a Sewer Opening

jects, but allows the waste water to run into the sewer. When necessary to clean or repair the drain the wheel is removed.—Contributed by C. M. McClave, Pittsburgh, Pa.

Gold Varnish

Equal parts, by weight, of shellac and concentrated alcohol make a good gold varnish. A .5-per-cent solution of boric acid in alcohol is added to the solution to give the varnish proper consistency. This varnish is colorless, but if a golden shade is wanted, picric acid is added until the desired color is reached.

Long Envelope Made of Two Small Ones

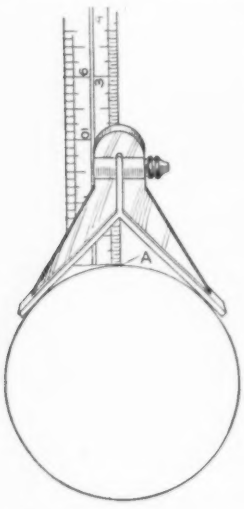
Occasionally a person has use for a long envelope and if none is at hand, two smaller envelopes will answer the purpose as well. Cut the right end from one and the left end from the other and place one inside of the other so that the open ends will lap, and paste them at the edge. In this way an

A Long Envelope is Quickly Made by Joining the Cut-Off Ends of Two Small Ones

envelope of the desired length may be made.—Contributed by W. M. Braly, Blackwell, Okla.

Laying Off Parallel Keyways

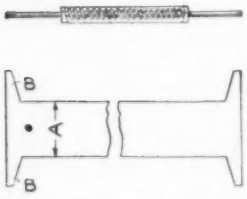
The following is a simple method of laying off keyways of any width and length, any distance apart, and all parallel with one another, on round stock.



Arrange the square head and center head as shown. After the square head is set level, scratch a line at A. This line will be the center of the keyway. Any number of keyways may be scribed by repeating this operation without moving the shaft.—Contributed by James Connor, Alton, Ill.

Solder Connections for Copper or Iron Wire

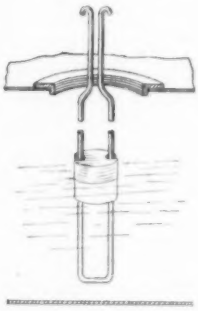
To prevent corrosion it is not considered good practice to make an unsoldered joint where the copper wire is connected to iron wire. Such connections must be made in telephone work where an insulated copper wire is attached to the iron drop wire. The following device may be of help to those who have not become skilled in the methods generally used.



A piece of tin, the size of which depends on the length of the joint and size of the wires, is cut as shown in the sketch. For a joint where No. 19 gauge copper wire is wrapped around a No. 12 gauge iron wire the width, A, should be ½ in. Bend the body A over the joint and crimp the projections B at both ends over, to hold it in place. The space in the tin is filled with melted solder. This will make a well soldered joint that will not corrode.—Contributed by Earl Daniel, Kewanna, Ind.

Gasoline-Tank Gauge

After making a search along the side of the road and in the tool chest to find something for measuring the amount of gasoline in the tank of my automobile it occurred to me to make a device for the purpose, which resulted in the construction of the one shown in the accompanying illustration.



A wire is bent as shown, and a cork float slipped in between the branches so that it will rise and fall easily, except when the ends are pinched together, in which case it will be held for measurement. The wire is run through the opening in the tank, and down to its bottom, and the cork allowed to float on the gasoline, then the ends are pinched together and the whole withdrawn. The cork will then be in the exact position where it floated on the gasoline and the amount of fluid in the tank thus easily gauged. Notches can be filed into one of the upright branches of the wire denoting inch marks, and will save bothering with a rule.—Contributed by Richard Russell, East Lynn, Mass.

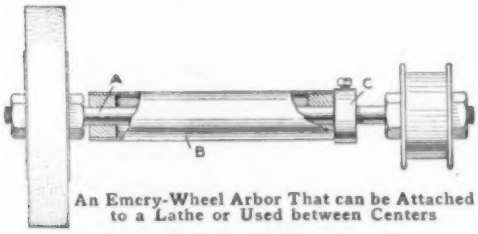
Protecting Bolt Threads While Passing Through Cored Holes

Machines not requiring accurate work usually have cored bolt holes. If more than two pieces are to be fastened with bolts it is difficult to enter a bolt without injury to the threads. Where there is a ½-in. clearance this can be readily remedied by making a point for the bolt,

as shown in the sketch. The one illustrated was for a 2½-in. bolt entering a hole 3 in. in diameter through two stands and a machine base. In this instance it was difficult to get the three pieces so that the holes would line up accurately. The point protected the threads, also made it easy to drive the bolts into place.—Contributed by Fred W. Fravel, W. Homestead, Pa.

Emery-Wheel Arbor for Lathes

The owner of a small lathe who has no emery-wheel stand can make an arbor for use in a lathe that will do all the grinding necessary for a small workshop. The shaft A is made of ⅜-in. steel rod of any length suitable for the lathe, both ends being threaded to receive two nuts, two washers, and the wheels to be used. A length of gas pipe, B, is fitted with a brass bearing in



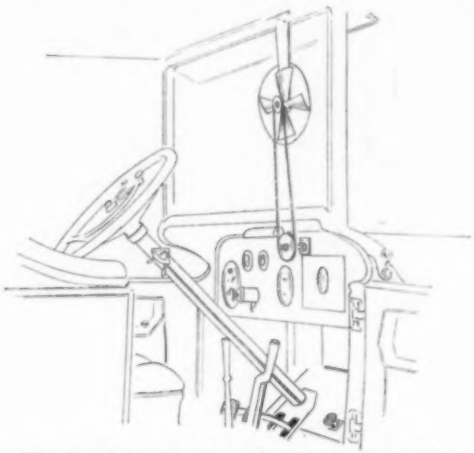
An Emery-Wheel Arbor That can be Attached to a Lathe or Used between Centers

each end to receive the shaft. The collar C is used to keep the shaft from slipping endways where it is necessary to have the pipe B shorter than the shaft.

The arbor can be used on the lathe centers or clamped to the lathe where it can be driven with a belt from a countershaft or from the main drive wheel.—Contributed by Arthur Jennings, London, Eng.

Ventilating Front Apartment of Automobiles

By the way of solving the somewhat troublesome problem of properly ventilating the front apartment of closed automobiles, one ingenious car owner hit upon the scheme shown in the sketch. The fan is arranged to be run by gearing from the engine. Its direction of rotation is such that a continuous draft of air is forced out. As its rate of rotation is very rapid, it does not obstruct the view of the driver,

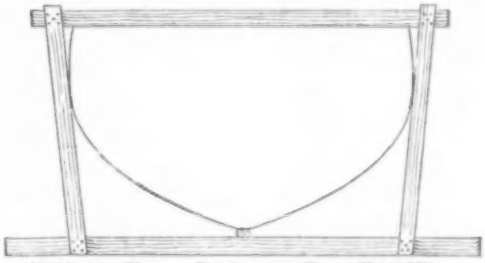


The Revolving Fan does Not Obstruct the View but Prevents Rain or Snow from Entering

and the current of air is sufficient to prevent the ingress of rain or snow.—Contributed by S. P. McMinn, Brooklyn, N. Y.

Keeping a Boat on an Even Keel Out of Water

To keep a boat on an even keel when the tide goes out and leaves it high and dry upon a mud shore, construct a frame of four strong planks and slip it over the bow while the boat is afloat. This frame should fit tightly



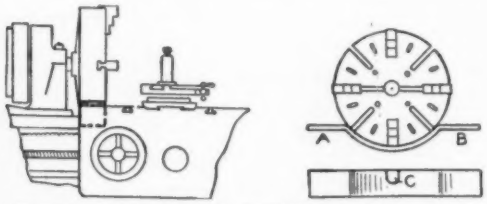
Holder to Keep a Boat on an Even Keel When the Tide Goes Out

around the boat amidships, as shown in the sketch.—Contributed by Forrest Clark, Coronado, Cal.

¶ Banana oil or turpentine is excellent for pasting tin foil on transmitting condensers.

Handling Large Chucks on Lathes

A chuck on a large lathe, almost the full size of the swing, can be easily handled with the use of a piece of

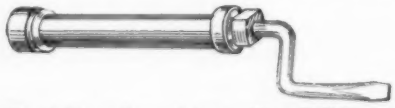


The Chuck Rests on the Metal Which is Supported on the Lathe Ways

metal on the ways, as shown. The flattened ends, A and B, rest on the ways, and the center part is bent to fit the edge of the chuck. If the chuck jaws project, a slot is cut in the metal, as shown at C, to receive one jaw end. The chuck can be easily slipped along on the ways when turning it from the threads of the spindle.—Contributed by J. Harger, Honolulu, H. I.

Screwdriver Made of a Bicycle Pedal

The screwdriver illustrated was constructed especially for turning in loose screws and nipples on bicycle spokes. It can be used for a great variety of work, however, where machine screws



A Crank-Type Screwdriver with a Ball-Bearing Shaft for Light Work

are used. The screwdriver is made of an ordinary hub of a bicycle pedal. The frame part is removed and the threaded shank of the pin is cut off, then drilled centrally and tapped to receive the end of the screwdriver blade. The blade is made of steel wire bent as shown.—Contributed by W. E. Nolan, San Francisco, Cal.

¶Crossing the belt that runs the radiator fan on an automobile will reverse its motion and force the warm air from the engine through the radiator and prevent freezing in severe cold weather.

Truck Wheel on a Grindstone Frame

A very convenient way of moving an ordinary grindstone from place to place is to make a small frame at the bottom of the posts and attach a small wheel, similar to a wheelbarrow wheel, with the lower part slightly above the surface of the ground. This will easily touch the ground when the other end of the frame is raised, and the stone can be pushed about in wheelbarrow fashion.

Care of Striping Pencils

Striping pencils, used by wagon painters and decorators, should always be thoroughly cleaned and greased with tallow after being used. A match box, or a similar box, cut as shown,

A Holder Made of a Match Box to Provide a Place for Keeping Striping Brushes

makes a good receptacle for these articles and also makes it easier to find them when wanted.—Contributed by James M. Kane, Doylestown, Pa.

Guard Attachment for a Long Ladder

The ladder attachment shown in the sketch serves as a guard for gutters and will enable the painter to paint back of the ladder. It can also be used on the roof of a building as a roof ladder. The attachment consists of two hardwood arms, 1 in. thick, 2 in. wide, and about 1 ft. long, fastened to the ladder stringers and joined together with a board nailed on their top edges. The board serves to hold the paint pot. When not in use the attachment folds against the ladder.—Contributed by J. V. Loeffler, Evansville, Indiana.

Practical Telephony

By HAROLD HINTON

Part XI—A Rural Telephone Line

Rural telephone lines are of two kinds: bracket and cross-arm. They are arranged for ground return and full metallic circuits, the latter being the best type of construction, under most conditions, for the ordinary rural line. The following costs will give an idea of the expense per mile of constructing the different kinds of lines:

FULL METALLIC CROSS-ARM CONSTRUCTION

26 poles, 25 ft. by 6-in. tops....@$1.50	$39.00
4 poles, 30 ft. by 6-in. tops....@ 2.15	8.60
30 6-pin cross arms.....@ .17½	5.25
180 1¼-in. oak pins.....@ .70 per 100	1.26
60 20-in. cross-arm braces, galvanized.....	1.44
60 ½ by 7-in. lag screws, galvanized.....	1.20
30 ½ by 6-in. lag screws, galvanized.....	.49
60 3½ by ½-in. carriage bolts, galvanized.....	.51
120 ½-in. galvanized washers.....	.25
60 No. 9 Pony insulators.....	.95
330 lb. No. 12 B. B. galvanized iron wire @ .03	9.90
Labor setting poles and stringing wire.....	28.00
Total cost per mile.....	$96.85
Each additional pair of wires to cost about	$27.00

per mile.

SINGLE-LINE CROSS-ARM CONSTRUCTION

26 poles, 25 ft. by 6-in. tops....@$1.50	$39.00
4 poles, 30 ft. by 6-in. tops....@ 2.15	8.60
30 6-pin cross arms.....@ .17½	5.25
180 1¼-in. oak pins.....	1.26
60 20-in. cross-arm braces.....	1.44
60 ½ by 7-in. lag screws, galvanized.....	1.20
30 ½ by 4-in. lag screws, galvanized.....	.49
60 3½ by ½-in. carriage bolts, galvanized.....	.51
120 ½-in. galvanized washers.....	.25
30 No. 9 Pony insulators.....	.48
165 lb. No. 12 B. B. galvanized iron wire @ .03	4.95
Labor setting poles and stringing wire, etc....	20.00
Total cost per mile.....	$83.43
Each additional pair of wires to cost about	$15.00

per mile.

FULL METALLIC BRACKET CONSTRUCTION

26 poles, 25 ft. by 6-in. tops....@$1.50	$39.00
4 poles, 30 ft. by 6-in. tops....@ 2.15	8.60
60 12-in. oak brackets.....	.72
60 No. 9 Pony insulators.....	.95
330 lbs. No. 12 B. B. galvanized iron wire @ .03	9.90
10 lb. nails.....@ .03	.30
Labor setting poles and stringing wires.....	29.00
Total cost per mile.....	$88.47
Each additional pair of wires to cost about	$27.00

per mile.

SINGLE-LINE BRACKET CONSTRUCTION

26 poles, 25 ft. by 6-in. tops....@$1.50	$39.00
4 poles, 30 ft. by 6-in. tops....@ 2.15	8.60
30 12-in. oak brackets.....	.36
30 No. 9 Pony glass insulators.....	.48
165 lb. No. 12 B. B. galvanized iron wire @ .03	4.95
5 lb. nails.....@ .03	.15
Labor setting poles and stringing wire, etc.....	18.50
Total cost per mile.....	$72.04
Each additional pair of wires to cost about	$16.00

per mile.

It will be readily seen by these figures that the single-line bracket construction is the cheapest, while the full metallic cross-arm construction is the most expensive. Where the telephone stations are more or less concentrated, the single-line type of construction using a ground return is all right, but where the stations are some distance apart, as is usually the case on rural lines, the full metallic construction is much more satisfactory in operation. The figures given in the above tables are for a straightaway run over level land, but when a line makes sharp turns, steep ascents or abrupt descents the poles should be guyed. This guying should not cost more than about 40 cents per guy. Galvanized iron wire, size No. 6, may be used for guying, instead of the galvanized strand which is used in the cities, because the construction is much lighter and the No. 6 wire may be run double or triple if necessary. If the poles are set to a depth of 4 ft. on the straightaway, and 5 ft. on corners or turns, very little guying will be found necessary except on hills. The guys in that case may be run as shown in Fig. 80, and the corner poles, when necessary, can usually be guyed as in Fig. 81, which will save the cost of planting an anchor or placing a guy stub. The 30-ft. poles, mentioned in the cost tables, are to be used when crossing roads, etc., where the wires should be high enough to clear a load of hay, for instance. A distance of 20 ft. in the clear, from the crown of the road to the wires, is usually sufficient for this purpose.

One of the most peculiar kinds of construction was a line in a rural district about one mile long with four stations, the instruments being of the local-battery type with a magneto ringer. No switchboard was, of course, used, as each station had its "ring." These four farmers were pretty well fixed financially and all had fences upon which they had strung two rows

of barbed wire, so they naturally hit upon the scheme of using these barb-wire fences for their "line."

After the line was connected up all went well until evening when they experienced their first case of trouble. The line was situated in a valley where a heavy dew fell at night, thus grounding the wires stapled to the posts. In exchange for a right of way of another telephone line old insulators were procured and the wires of the fences fastened to them, with the result that no further trouble was experienced from this source.

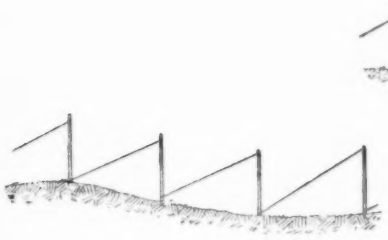


FIG 80

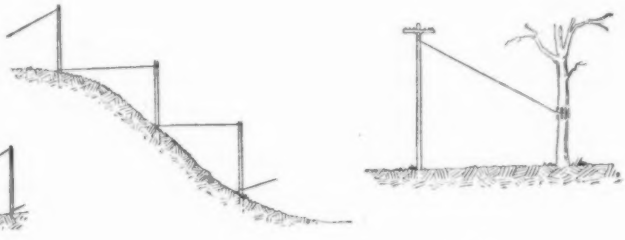


FIG 81

Method of Guying Poles on Hill Sides, and an Inexpensive Way to Support a Corner Post

It is a common occurrence through rural districts to see telephone wires carried along fences as shown in Fig. 82, but to see a rural submarine is the privilege of but few. In a certain locality two farming communities were separated by a swamp about 900 ft. in width at the point where the two "systems" could most readily be connected together. There were only seven stations on one line and six on the other, so they wanted to bring the two together and thus connect the two settlements. The farmers put in poles during the winter months when the swamp was frozen, but when the thaw came the poles either toppled over or sank out of sight, naturally putting the line completely out of business, and preventing communication between the two points until the following winter. The next step was to string insulated wire along through the swamp, the following winter, attaching it wherever they could. This did not survive very long, however, as the falling limbs from the rapidly decaying trees very quickly broke down the wires. It was the third winter that a young man suggested a "submarine cable" and, after another collection was taken up with which to purchase the materials, he set out to put his idea into practice. About 1,000 ft. of No. 12 rubber-covered, triple-insulated, weather-proof copper drop wire, commonly called twisted-pair, 50 lb. of friction tape, and 2 gal. of insulating varnish were purchased. The friction tape was wrapped around the twisted pair for the full length and then given a good, heavy coat of varnish. This was allowed to become thoroughly dry and a second layer of tape was rolled on, then more varnish and a third layer of tape. The remainder of the varnish was spread on the outside layer until the surface was pretty hard and absolutely waterproof. Some old scrap wire was "requisitioned" from the junk heap and securely fastened to about 20 large, flat stones. These stones were then fastened to the cable at about 40-ft. intervals, just before placing it on the ice in the swamp. The cable was

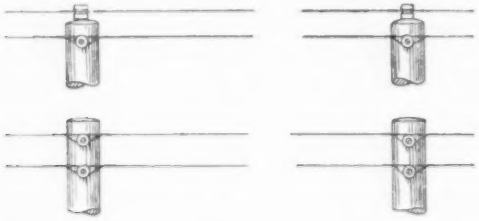
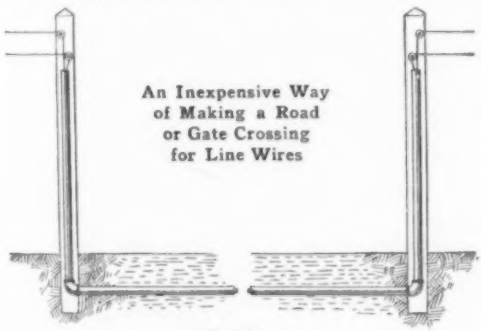


FIG 82
Two Ordinary Methods of Securing Line Wires to the Posts of a Farm Fence

then connected up at each end and service was again restored. It worked all right, but the wise ones said "wait till the ice goes out." They waited and the ice went but the service was still uninterrupted. They finally went down to take a look at the cable and failed to find it, as it had sunk out of sight in the soft slime. The man who had thought out the scheme had worked on the principle that the great danger to anything that must be in water lies "between wind and water" and he therefore placed the weights on the cable to sink it down deep in the ooze. That homemade submarine has been in service for several years and is still giving good service. This method may also be used when crossing wide streams, etc., and 5 or 6-lb. window



An Inexpensive Way of Making a Road or Gate Crossing for Line Wires

FIG. 83

weights may be used instead of the cumbersome stones.

When making road and gate crossings with the fence lines, the best way is to get some heavily insulated wire

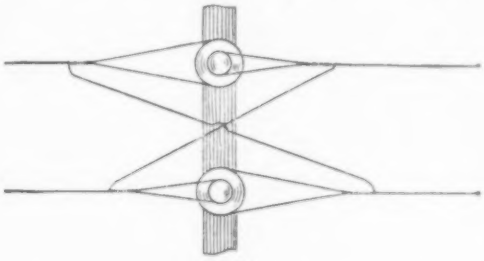


FIG. 84

A Transposition to Reverse the Sides of the Circuit by Means of a Grooved Insulator

of the same gauge as the line wire and run it through a ¾-in. or larger pipe. This method is shown in Fig. 83. Another point to remember is to always securely tie the line wires to the insulators whether they are glass, porcelain, or broken-off bottle necks. It is also advisable to put a lightning rod on about every tenth pole and thoroughly insulate the ground wire from the pole.

When the line is a long one, having two or more pairs of wires, it is often, in fact usually, advisable to run in a transposition about every 1,300 ft. This transposition simply reverses the sides of the circuit and is accomplished by means of a double-groove insulator. A transposition is shown in Fig. 84

(To be continued)

Watering a Dry Well

A well that goes dry in summer because it was dug only to the rock may be watered successfully by a process used by me, as follows: A hole was drilled by hand with a churn drill, 7 ft. deep in the rock. This was accomplished by one man in less than one day. The hole was thoroughly swabbed out and cleaned of sand, and a piece of galvanized-iron pipe driven into it. A good flow of water was struck at this depth and what had been an unreliable well became a valuable one.—Contributed by Hollister Sage, Waterbury, Connecticut.

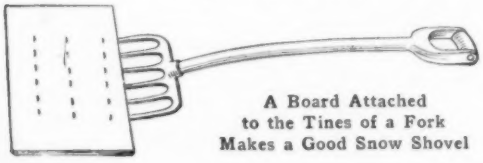
Starting Nails in Inaccessible Places

When driving nails in inaccessible places I found the following arrangement quite handy: I drilled a ⅜-in. hole, 1½ in. deep, in the end of the hammer handle. The nail to be driven is

placed head first in the hole which holds the nail so that a jab of the hammer will start it in places out of reach of the hand. The hammer is then withdrawn and the nail driven as usual.—Contributed by Patterson Merrill, Chicago, Ill.

Substitute for a Snow Shovel

Having no snow shovel at hand I made a good substitute by fastening a board to a dung fork, as shown. Wire

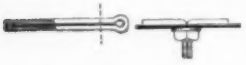


A Board Attached to the Tines of a Fork Makes a Good Snow Shovel

nails were used, clinched on both sides of the tines.—Contributed by J. Morton, Cochituate, Mass.

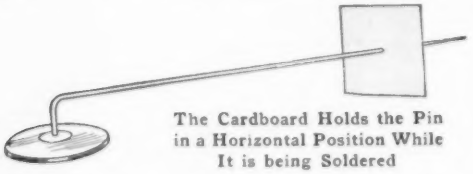
Homemade Toggle Bolts

The necessary toggle or twin bolt for use in metal was not at hand when I wanted to fasten a robe rail to the metal back on the front seat of my automobile. I made substitutes by threading the ends of two spring cotters, cutting the heads off and bending them as shown. They served the purpose as well as the regular toggle bolt.—Contributed by Chas. H. Sanders, Glendale, Cal.



Repairing a Scarf Pin

When soldering the pin tongue in place on a scarf pin, use a piece of cardboard as shown, and it will be kept level.—Contributed by W. A. Jones, Raleigh, N. C.



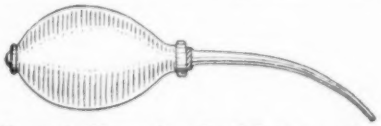
The Cardboard Holds the Pin in a Horizontal Position While It is being Soldered

Trousers Guards an Aid to Drawing on Overalls

When a person's work demands the use of overalls, I find it very handy to keep a pair of bicycle trousers guards in the pockets, and have them ready to place on the regular trousers before the overalls are drawn on. This will keep the legs of the former from being drawn halfway to the knees, as is often the case. After the overalls are on, the guards can be removed and placed in the pocket.—Contributed by R. B. Strong, Homer, Mich.

Blower for Removing Dust in a Watch

Never blow the breath into a watch movement to remove dust, as the moisture from the breath will in all probability rust the hairspring. Use a



A Dentist's Blower is a Good Device to Use in Removing Dust in a Watch

blower, such as dentists have for blowing out cavities in teeth, as illustrated.

A Revolving Lathe Center

The revolving center has the advantage of keeping the work true that is run at a high speed, such as soft cast iron, brass and wood. The center is

A Revolving Lathe Center That will Prevent Wear on Work Running at High Speed

made of carbon steel and is bored a snug fit to receive the revolving center, which is grooved on the shank to run freely on the pin that holds it in place. An oil hole must be provided to lubricate the shank.—Contributed by G. Barrett, Hamilton, Ont.

Polishing Glass

Calcined magnesia, rubbed down with pure benzine, makes an excellent preparation for cleaning and polishing the surfaces of fine glass, such as costly mirrors, etc. The mass formed must be sufficiently soft to allow drops of the liquid to be squeezed out of it. The mixture should be kept in closely stoppered bottles, and, in use, a little of it is placed on a bit of cotton or a soft rag with which the glass is rubbed.

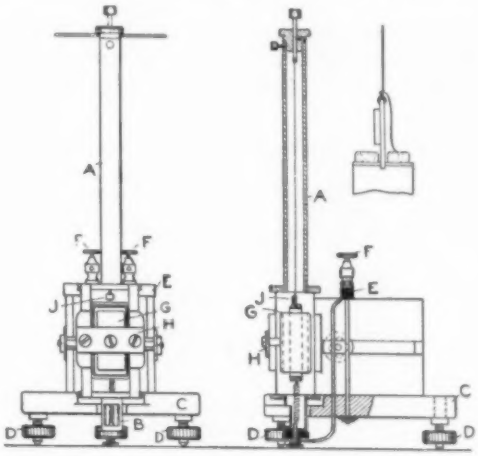
A Torsional Wire Galvanometer

The work at hand required a sensitive galvanometer and as the cost of such an instrument was beyond my means, I constructed a very good one from parts of a two-bar telephone magneto ringer. The sketch gives an idea of its appearance. The brass bearing heads of the magneto were drilled out and brass tubes, A and B, soldered into them. The top of the tube A was fitted with a brass cap, a long adjustment rod, and a small brass rod with a setscrew for holding the coil-suspension wire. The tube B was fitted with a black fiber cap, brass bushing and thumbscrew, to which was fastened the other terminal from the coil.

The instrument is mounted on a well varnished base, C, with three brass bushings and leveling screws, D, with fiber thumb wheels. It was fastened in place by a bolt through the base C to a fiber bar, E, supporting the binding posts F. One binding post is grounded to the instrument and the other is connected by a wire to the terminal on the end of B. A core, G, for the coil, was made from ¾-in. water pipe, turned up smoothly and held centrally in place by a short stud from a brass plate, H, fastened across the pole faces.

The suspended system was next in order. A coil mount was made of thin strip brass, bent to a rectangular shape, the ends being butted and soldered. A small brass-wire hook was soldered in the center of one end for suspension. A coil of No. 40 gauge enameled wire was wound upon the mount, leaving the ends long enough to suspend the coil from the top of the tube A and for a "pig tail" terminal connection at the bottom of the tube B. The coil was wound to a resistance of about 2,000 ohms. A small piece of mirror, J, was cemented to the hook. The coil was given a coat of shellac.

This type of an instrument must be used with a scale on the wall and a source of light, the light being reflected onto the scale by the mirror. If extra resistance is added and calibrated with a standard instrument, it can be used as a voltmeter. This instrument was inexpensive to construct

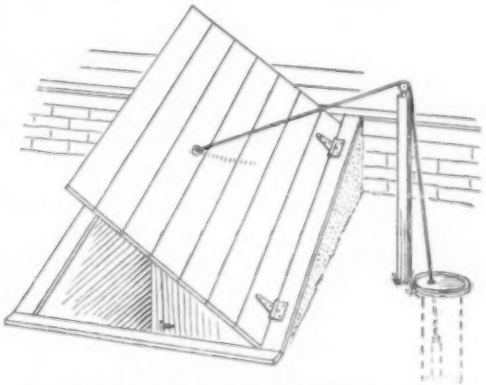


Galvanometer Constructed of Parts Taken from a Two-Bar Telephone Magneto Ringer

and it served its purpose admirably.—Contributed by P. K. McGall, W. Orange, N. J.

Counterbalance for a Cellar Door

The raising of a cellar door can be made quite easy if there is a counterbalance of almost the same weight as the door. One farmer attached this balance in the manner shown, with a rope running over a pulley in the upper end of the post on which the door rests

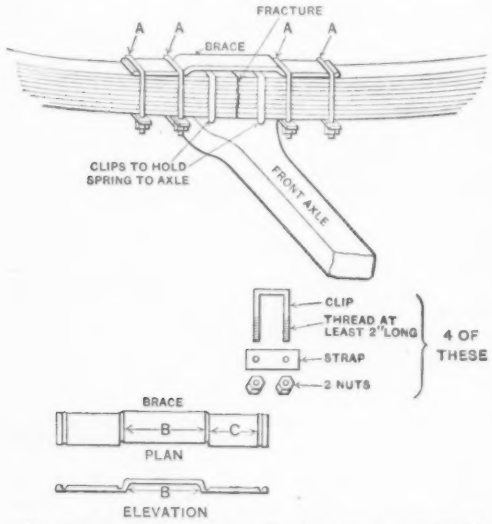


The Weight is Swung from the Rope in the Tiles Where It is Out of the Way

when open. To make room for the weight, two tiles are sunk into the ground at the right place.

Temporary Repair on an Automobile Spring

While making an extended tour in an automobile I had the misfortune to break a front spring through the center. As there was no garage near, I had a blacksmith make a brace, and clips, AAAA, to go over the broken parts, as shown. The width of the brace should be equal to the width of the spring and the part B long enough to lay over the clips holding the spring to the axle. The ends C should be about 3 in. long. Such a brace will effectually repair either a front or rear spring.—Contributed by L. L. Llewellyn, Hayward, Cal.



The Brace Clamped to the Broken Parts will Hold the Spring Temporarily Until It can be Repaired

A Homemade Valve Tool

A cheap and very serviceable tool, for compressing and holding the spring while removing or inserting the valve stem on an automobile or other gasoline engine, is easily and quickly made where one may have access to a forge. The tool is forged from an ordinary worn-out, flat 10-in. file. Carefully draw the temper, then flatten it out and shape the end as shown, making the slot ½ in. wide and ¾ in. deep for ordinary use, or any other dimensions to suit special cases. A notch is made in the side, $\frac{3}{16}$ in. wide and ½ in. deep, with a projecting prong.

A Tool for Holding Springs While Valves are Being Removed for Repairs

The second member of the tool is a simple hook made of ⅜-in. stock of equal strength, having an opening of about 4 in. and a length of 6 in. A piece of dog chain, or any chain having flat links, about 18 in. long, the closed end of which is slipped into the notch on the side of the tool, is attached to the hook.

To use the tool, attach the hook to the exhaust manifold, or other part, of the engine, allowing the chain to hang in front of the spring to be raised. Insert the notch at the end between the coils of the spring near the lower part so that the valve stem will be between the prongs. Hook a link of the chain in the notch at the right height, and by bearing down on the handle the spring is easily compressed.—Contributed by C. F. Heizer, Falfurrias, Tex.

A Twist-Drill Driver

When a hole must be drilled in a deep groove, recess, or place, and an ordinary drill is not long enough, it is quite common practice to forge a former or flat drill on a length of tool steel, leaving a shank long enough to reach the required distance or more. But a flat drill cuts slowly and takes more power than a twist drill and it is apt not to drill the proper size.

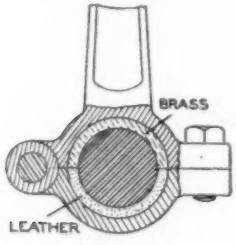
An Extension Twist-Drill Driver for Drilling Holes in Places That a Short Drill will Not Reach

If a twist drill is at hand, a strong and simple driver can be made for it by using a piece of machine or cold-rolled steel, and at a cost no greater than the forging of a flat drill. First make a saw cut through the center of the metal on the shank end and then cut out the piece so formed, about ½

in. long as shown. This leaves a positive driving-shank end on the drill. Drill a hole in the bar of steel, about 1 in. deep and having the same diameter as the drill to be used. Above this drilled hole cut a notch through one-half of the steel bar, making the notch fully as long as that on the drill-shank end and so that it will meet the end of the drilled hole. Slip the shank of the twist drill into the hole, passing its extending end up over the notch in the bar, and a combination tool will be had that is very good.

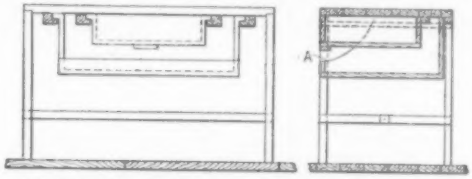
Temporary Leather Bearing Replaces Babbitt in Automobile Engine

While cross-country motoring, the crank case of the motor ran out of oil which resulted in the babbitt of the lower half on the connecting rod melting out, and we were left in the middle of a river with a badly disabled engine. I unscrewed the connecting bolt, cut off a short piece of my belt and clamped it in the place of the babbitt. The crank case was filled with the right amount of oil and we proceeded to our destination, 6 miles, then back 14 miles without any trouble, the motor running very quietly all the time. When arriving home the leather was removed and found to be in good shape, sufficient for another run. The sketch shows where the leather was used.—Contributed by Fred B. Stoner, Masontown, Pa.



Handy Arrangement of Bench Drawers

A good method of arranging drawers to hang under a bench, and one which permits any one working at the bench to sit down, is shown in the sketch and, as may be seen, consists of a small drawer, in which can be kept the small and most-used tools, and a large drawer, to hold work under construction, or other things which would otherwise have to be kept on the bench.



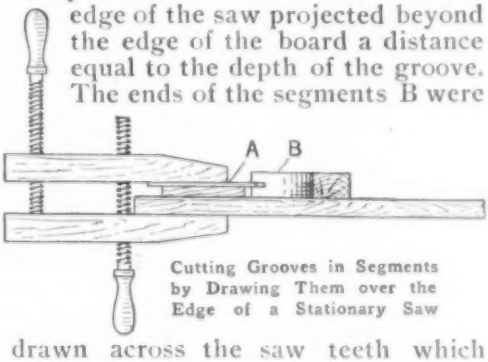
To Place One Drawer within Another under a Bench Top is Handy and Saves Space

Another purpose for which the edge A of the large drawer can often be used is to rest work on while sitting down and filing, holding the work with one hand and filing with the other. This drawer is both handy and space-saving.

Cutting Spline Grooves by Hand

Having occasion to cut some grooves in segments for a pattern at a time when the power was temporarily removed, I found the following method very effective:

A fine-toothed ripsaw, A, and a board of the proper thickness were clamped to a flat surface so that the edge of the saw projected beyond the edge of the board a distance equal to the depth of the groove. The ends of the segments B were drawn across the saw teeth which readily cut the grooves.—Contributed by Alden T. Stubbs, Malden, Mass.

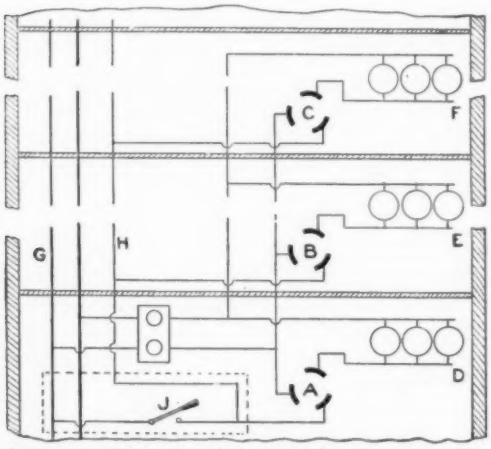


Cutting Grooves in Segments by Drawing Them over the Edge of a Stationary Saw

¶When the notches in a glass cutter become worn or the glass happens to be a trifle too thick for them, use a monkey wrench. The wrench is better to use where a narrow strip is to be cut and chipped away.

An Emergency Burglar Circuit

Often a burglary might be prevented if it were possible for the watchman to turn on all the lights in a building at the same time from some more or less



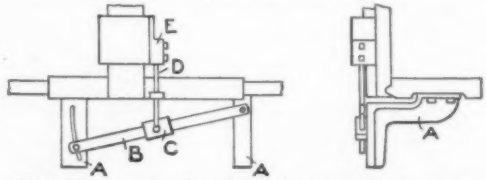
A Separate Light Circuit for Applying Current to All Lights of a Building from a Secluded Switch

protected and out-of-the-way place. The same arrangement will prove quite useful in cases of fire, as the firemen may easily turn on all the lights in the building by simply closing a single switch. The circuit shown diagrammatically in the accompanying sketch accomplishes the desired results, and, at the same time, it is impossible to turn any one of the individual groups of lights off so long as the master switch is closed. Referring to the diagram it will be noticed that each of the switches, A, B, C, etc., controlling the individual groups of lights D, E, F, etc., are of the two-way type, with one point connected to the main lead G; another to one side of the group of lamps the switch controls, while the third point of the switch is connected to the main H, which in turn connects with the main G through the switch J. The switches A, B, C, etc., are so constructed that the lead from the lamps into the switches will always be connected to either the main G or H. It is thus obvious that so long as the switch J is open the lamps will not light when the switches A, B, C, etc., are in one position, but will light for the other position. If the switch J is closed, all the lamps will light, and it will be impossible to turn any of them out by operating the switches A, B, C, etc. Such a circuit can be installed so as to meet the underwriters' requirements and may pay for itself in a few minutes at some unexpected time.

Taper Attachment for Lathes

To turn a taper on a lathe not equipped with a compound rest necessitates shifting the tailstock, which, however, is not the best method for doing the work. The proper way is to have an attachment for controlling the feed of the tool, and this device can be easily made and attached to any lathe. Two bracket castings, A A, are bolted to the rear part of the lathe bed after they have been machined, so that the surfaces can be lined and leveled up true with the ways. One end of a bar, B, is pivoted to one bracket, and the other end is provided with a bolt that swings in a slot cut in the other bracket for adjustment. The block C slides on the bar B and carries with it the rod D which is inserted in a hole in a piece of metal, E, fastened to the cross slide of the carriage. The rod is adjusted to the work in hand by slipping it through the block E, and when set, it is clamped with two setscrews.

In turning tapers, the attachment is



The Slide on the Bar Controls the Cross Feed So That a Taper Cut is Taken

applied and the cross-feed screw or nut is disconnected. The travel of the carriage lengthwise in taking a cut causes the tapering slide to control the cross feed in accordance with the taper for which it was set.

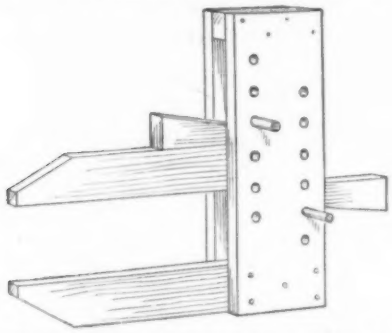
¶Rough castings should never be slid on machine beds.

Dispelling the Odors from Cooking

To do away with the odors from cooking and the impure air in restaurants, just before serving the meals fill a bowl with steaming hot water, place it in the center of the room and pour in a few drops of oil of lavender. The oil is easily handled, is nonpoisonous and can be purchased at any drug store. It is inexpensive, as a few drops in each bowl is sufficient to deodorize a large room. The bowl may be removed after all the oil is evaporated. The process works equally well in private kitchens and dining rooms.—Contributed by Loren Ward, Des Moines, Iowa.

Substitute for Carpenter's Clamps

A very good substitute for clamps can be made as shown in the illustration. It consists of two side boards

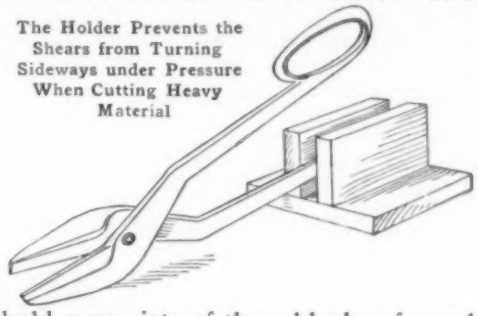


The Clamp is Actuated by Wedges and Pins for the Adjustment to the Width

fastened together with one fixed jaw and a piece between their ends. The other jaw is loose so that it can be set as desired and clamped on the work with the pins and wedges. The size of the pieces will depend on the size of the clamp.—Contributed by A. S. Thomas, Amherstburg, Ont.

Cutting Thick Metal with Hand Shears

If it is necessary to cut a thick piece of metal with a pair of hand tinner's shears construct a shear holder of wood, as shown, and the cutting will be made quite easy. Place the holder on the bench, or floor, with the lower handle of the shears in it. Pressure is applied only to the upper handle, and a clean cut can be made. The

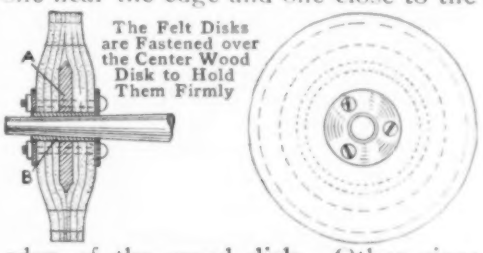


The Holder Prevents the Shears from Turning Sideways under Pressure When Cutting Heavy Material

holder consists of three blocks of wood nailed or screwed together, the upright pieces being placed just far enough apart to receive the handle snugly.—Contributed by U. B. Gilroy, Marysville, Cal.

How to Make a Felt Buffing Wheel

In making a felt buffing wheel of about 3-in. diameter, construct a center disk, A, of wood, about 1½ in. in diameter, and mount it on a straight wood hub, B, of sufficient length for the width of the wheel face. Two washers, each 1 in. in diameter, are fitted to the ends of the hub and three holes drilled through their outer edge for rivets. Holes are punched through the felt disks to coincide with the holes in the washers. An even number of felt disks are placed on each side of the wooden center disk and all are fastened together with the three rivets through the washers. The felt disks extending beyond the edge of the center disk are sewed together by making two seams, one near the edge and one close to the

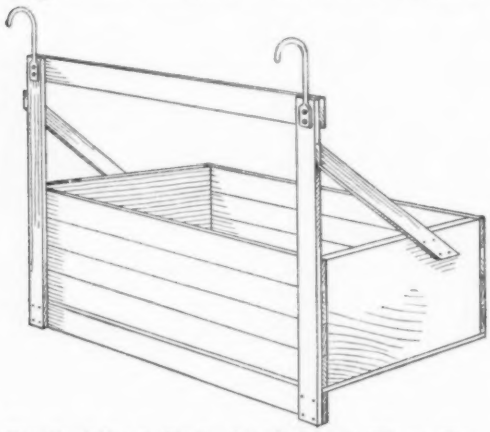


The Felt Disks are Fastened over the Center Wood Disk to Hold Them Firmly

edge of the wood disk. Other sizes can be made by relatively changing the proportions.—Contributed by W. A. Henry, Galesburg, Ill.

A Wagon Feed Box for Horses

A teamster who is obliged to feed his horses during the noon hour at the wagon has devised a feed box to take



The Feed Box is Easily Attached to the Wagon Box When It is Time to Feed

the place of a nose bag. When the box is hooked over the top edge of the wagon box the height is just right for the horses. The box prevents waste of grain and provides a better way to feed the horses than in the wagon box.—Contributed by Vinton V. Detwiler, Manhattan, Kan.

End Gauges

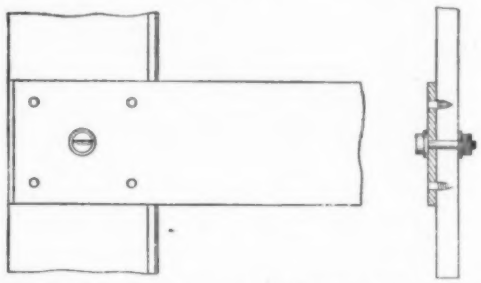
A very useful set of end gauges that have proven satisfactory and flexible for the manufacturer of machine tools was made of tool steel, 1⅛ in. in diameter, as described by a correspondent of American Machinist. A piece of the steel was centered in a lathe and knurled the entire length, then pieces were cut off, faced, drilled and tapped,

Gauges Cut from Tool Steel, Hardened, Then Their Faces Ground True to Size

and the ends turned down, as shown, so that they would have a flat surface for gauging. The tapped holes allowed them to be turned on a stub arbor so that, after hardening, the surfaces could be ground to size. The use of headless screws permitted any number of gauges to be connected together so that almost any length could be obtained.

Removable Head on a T-Square

Having occasion to carry a T-square with me on daily journeys, I usually found it knocked out of true as it, being an unwieldy package, was always striking some obstacle. I overcame the difficulty by devising a demountable T-square, as shown. The square was taken apart and then screwed together again, using round-head brass screws. In the center of the head and blade a hole was bored to admit a bolt having a knurled nut. The heads of the screws were then filed off to make them into studs. The head of the T-square is thus easily taken off and replaced, and it always



The Head can be Removed and Replaced and It will Always be Square with the Blade

adjusts itself to the original position. —Contributed by Edwin E. Hahn, Philadelphia, Pa.

An Emergency Nut

In doing some repair work I found that I had two bolts and only one nut. The nut happened to be of a good thickness and in order to make a temporary job of it, the nut was split with a hacksaw to make two nuts of one.—Contributed by Wm. A. Murray, Cold Spring, N. Y.

¶A lathe bed having a scale is handy for some classes of work.

Bonding and Grounding Aerial Cables

By GEORGE LITTEL

While electrolysis proper does not attack aerial cables, it is equally important that these cables are bonded and grounded in the same manner as for underground work. The large number of high-potential circuits which run parallel with, and across the telephone, telegraph, light and power cables makes the bonding and grounding necessary. The high-potential wires often drop upon the cables below, and the current jumps through the underground fuses, runs down into the underground cable and makes its way through to the heat coils on the main distributing frame in the central station. Also, in damp weather, where the high-potential circuits and the telephone cables are on the same poles, the induction will often seriously interfere with the proper working of the latter. Lightning also is liable to damage aerial cables and for these three reasons the aerial cables must be properly protected, as an accident may come to them at any time. The following instances of troubles caused and diverted by improper and proper insulation of cables show that too much care cannot be taken to reduce the maintenance expense.

In one instance the cable was struck by lightning, which jumped through the underground box, followed down the cable, and finally, about ½ mile from the underground box, jumped through the sheath to ground. The interesting part of this case was that the lightning had confined itself to one pair of wires all the way in the cable until it went to ground, where it fused off about 75 pairs of wires and burned a hole in the sheath about the size of a lead pencil. The second case occurred in a cable that ran parallel with an interurban trolley feed and on the same pole with it. In this instance the aerial was properly bonded and the damage was limited to that part of the aerial between the start of the trouble and the ground connection. The feeder dropped across the aerial and melted the armor completely for over 300 ft., but there was not one single station, out of over 50 party lines, that was put out of commission.

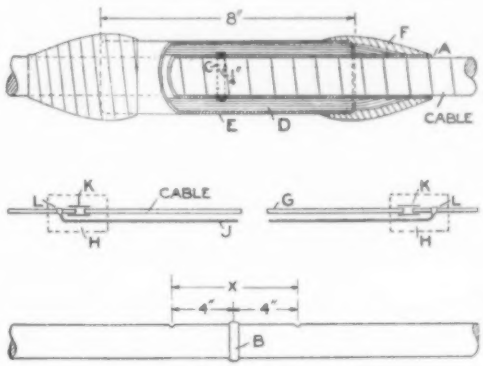


FIG. 1

Method of Insulating the Cable Sheath and Manner of Connecting the Bond Wire in the Manholes

It can be readily understood that the lack of bonds and ground in the first case caused a large repair expense, and that the proper bonding and grounding, in the latter, saved twice as much as otherwise would have been destroyed.

When cables are run across iron bridges the best plan is to insulate them at both ends. This can be easily accomplished, even though the cable is run in an iron pipe, with the aid of insulating joints, as shown in Fig. 1, in which A represents the cable sheath. This insulating joint is not made at a splice in the cable but a piece of sheath, B, about ¼ or ½ in. in width, is removed all the way around the cable. This cut is not made, however, until the cable is soaked with paraffin at that point. This is done by cutting small holes, about 4 in. each side of the place where the cut is to be made, as shown at X, and into which melted paraffin is poured until the cable is thoroughly saturated with it. The cut proper is then thoroughly boiled out with paraffin and the opening completely filled by winding candle wicking, C, around the cable until the slot

is more than full. The wicking is then boiled out with more paraffin and the holes X closed with solder.

The entire cable is then tightly wrapped, for 4 in. each side of the cut,

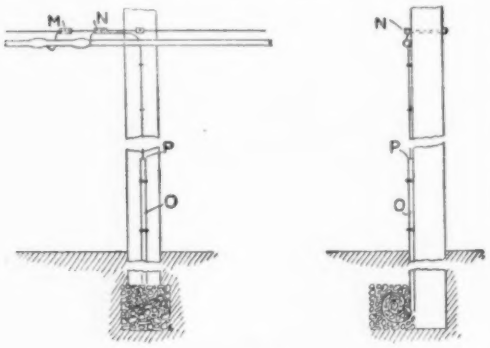


FIG. 2

An Aerial-Cable Bond to the Messenger and a Ground Connection at a Pole

with alternate layers of common friction tape and okonite tape, using four layers of each and painting each layer with a good asphaltum paint, as shown at D. A lead sleeve, E, is then slipped over the cable and the ends dressed in to fit the tape tightly, so as to aid in excluding moisture in case the splice is exposed to dampness. The joints of the sleeve are then built up with tape, as shown at F, and given two coats of asphaltum paint. The part of the cable touching the bridge is shown at G, while HH are the manholes at each end in which the joint is made. The bonding wire, the size of which depends on the amount of current flowing into the cable, is shown at J. The position of the insulating joints in the manholes are shown at KK, and the point of connecting the bond wire with the cable sheaths, at LL. The ends of the bond wire should be securely soldered to the sheath. The object of these joints is to break the connection of the cable sheath and at the same time maintain a continuous circuit for the prevention of electrolytic action.

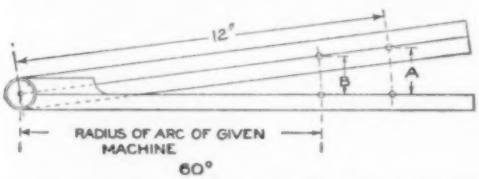
The proper method of bonding an aerial cable is shown in Fig. 2. This bond should be made every 1,000 ft., and a ground connection every 5,000 ft. The method of attaching the messenger to the cable is shown at M, where three bolt clamps are fastened to the messenger and also to a piece of messenger wire, about 3 ft. long. The far end of this short piece of messenger wire is then fanned out, placed around the cable and fastened with a small piece of copper wire. A solder joint is wiped over both the cable and the fanned-out wire, and a neat appearing as well as a mechanically perfect job is the result. When the ground wire is run, the bond and ground connection are made as shown at N, and the wire must be continued from the clamp, down the pole, and into a ½-in. galvanized-iron pipe, O, which extends about 3 ft. above the ground. The wire should be a 6M guy wire and is fastened to the pole with galvanized staples, about 2 ft. apart, and the pipe is held to the pole with clamps. Where the wires enter and leave the pipe, at P, the openings in the pipe must be closed with solder to exclude all dampness. A hole, about 18 in. square, is then dug at the base of the pole and 4 ft. below the surface of the earth. The hole is filled with coke or charcoal and a 15-ft. coil of ground wire placed in it.

Taper Gauge for Boring Mills

The fact that the boring mill is one of the most difficult machines to set for a true taper, brought about the making of the gauge shown in the sketch for this work. It consists of two pieces of steel, $\frac{1}{32}$ in. thick, 1 in. wide, and 15 in. long, jointed like a blacksmith's rule. A true center is left in the jointing screw and from this point a center line is drawn on each blade. The upper blade is cut along this line to within about 2 in. of the joint, and the edge is trimmed and beveled so that it coincides with the line on the other blade. An arc of a circle is marked on both blades 12 in. from the center of the joint, and the space between is graduated as fine as desired, but for ordinary purposes a fine center-

punch mark at a corresponding point on each 12-in. arc of the two blades will be sufficient, if accurately measured.

To use the tool for any machine, set the dividers to 60 deg. of the graduated arc and lay out that distance on both blades. When the points at 12 in. are the required distance apart, the distance through which the zero mark on the machine must be moved is found at the arc which represents the circle of the machine, and it is only necessary to transfer this distance with the dividers. The distance A is equal to one-half the required taper per foot, and the distance B is the distance to move the zero mark to cut the required taper. It must be remembered that the boring

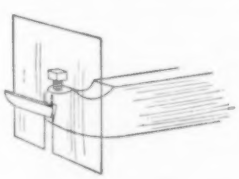


Gauge for Setting Boring Mills or Other Machines to Do Accurate Taper Work

head is set just one-half of the total taper per foot, and it is most important that the cutting point of the tool is set on the center line parallel to the cross rail.—Contributed by Thomas M. McKnight, Willoughby, Ohio.

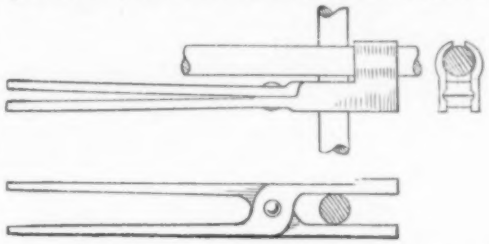
Lathe-Tool Guard

A guard placed on a lathe tool, as shown in the sketch, is a great aid in preventing injury to the workman's eyes, especially where the work must be closely watched. The guard consists of a piece of celluloid, about 2 in. square, cut as shown and slipped over the tool with the tongue folded in between the tool top and the end of the setscrew. The guard being transparent, the work can be seen through it.—Contributed by Jos. J. Kolar, Maywood, Ill.



Tongs for Holding Flat and Round Stock

These tongs differ from the ordinary kind in the jaws only, having side projections with curved inside surfaces to

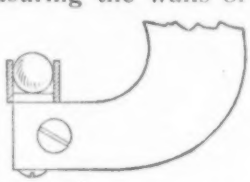


The Jaws' Shape is Such That Either Flat or Round Stock may be Held in Them

hold the round stock. They will be found especially useful in welding short pieces of iron with a jump weld, as the stock can be held either sideways or endways, as shown.—Contributed by Edward Miller, Northampton, Massachusetts.

Measuring Tubing with an Ordinary Micrometer

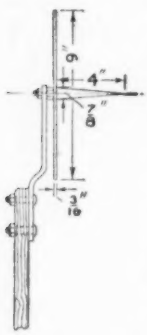
A little inexpensive attachment for any ordinary micrometer can be made for accurately measuring the walls of tubing. The attachment is made as follows: A piece of $\frac{5}{16}$-in. cold-rolled steel is drilled to make a push fit for a $\frac{1}{4}$-in. hardened steel ball. The steel is fitted snugly on the anvil of the micrometer. The steel ball is adjusted in the bushing so that it will protrude $\frac{1}{16}$ in. The bushing is then placed on the anvil of the micrometer so that the ball touches it. In measuring the wall of a tubing all that is necessary is to subtract $\frac{1}{4}$ in., or .25 in., the exact size of the steel ball, from the amount designated on the scale.—Contributed by Walter Butz, Pearl River, New York.



¶Heat the drill when drilling frozen earth for blasting purposes and the drill can be easily withdrawn.

Shifter for Overhead Belts

Overhead belts at a considerable distance from the floor are hard to throw from the pulley, when necessity requires it, without stopping the entire machinery in the shop.



The sketch shows a device consisting mainly of a pointed or tapered prong and a circular plate behind it, to engage the belt. Attached to a long wood handle, the arrangement is very handy and convenient as a safe means for throwing overhead belts. The prong and plate engage the belt at the same time, in throwing a belt, no matter which way the pulleys may be turning.

Coloring Copper

Copper and brass lend themselves readily to a coloring process and may be worked to all shades imaginable, excepting the lighter shades, which are lost on a copper surface, as that metal cannot be given a tint lighter than its natural color, says a correspondent of Sheet Metal Shop. Zinc colors fairly well sometimes, through a narrow range, while tin is a hard metal to handle as regards oxide colors.

Copper can be carried through the entire range of shades, from a very light copper color to the darkest brown, or even black, by merely oxidizing the surface of the metal. Make a paste of iron oxide and graphite, with wood alcohol or with plain water, and apply this to the article, which is then heated in an oven or over a gas flame. It is better to use alcohol, as it dries out much quicker. The color obtained will depend on the amount of iron oxide mixed with the graphite, and the length of time the heat was maintained. The more oxide in the coating, the darker the shade given to the copper.

The remains of the coating should be removed with a brush or cloth moistened in alcohol, and when the surface has become quite clean, the color should be protected by applying varnish, lacquer, or pure wax, which may be laid on with a brush while the copper is heated. Some brown colors are obtained by using a mixture of verdigris, sal ammoniac and vinegar, using two or three times as much verdigris and sal ammoniac as vinegar. The heat treatment is the same as in the previously related process and the color obtained can be made much darker by adding some blue vitriol to the solution.

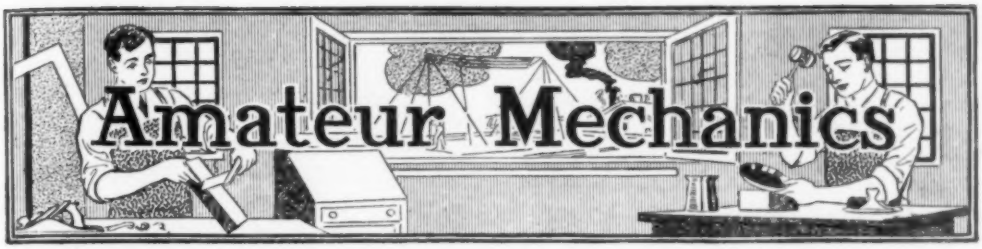
A red brown may be given by using a vinegar paste containing equal parts of verdigris and cinnabar, together with two and one-half times as much each of sal ammoniac and alum. The heat treatment is the same as for the other coatings.

A wide range of colors, comprising shades from blue-black to blue-gray, may be given to copper by dipping it in a hot "liver of sulphur" solution and then washing thoroughly, redipping or scratch-brushing and again dipping and washing according to the tint desired. This can only be learned by experience.

Holding Thin Brass Tubing for Turning

In cutting off, turning, or filing thin brass or copper tubing much trouble will be experienced from its buckling or crushing under the pressure of chuck jaws or vise jaws. To prevent this trouble use a plug of wood driven lightly into the hole. Where a number of pieces of the same size are to be handled, a metal plug or arbor can be made; and if a still greater number are to be worked, it will pay to have an expanding arbor which may be made by splitting the metal plug, making a taper hole in it and fitting a plug in the hole.

¶The part of a metal post that is set in the ground may be kept from rusting by painting it over with a coat of cement.



Drill Press on an Ordinary Brace

As the greater part of the energy required for drilling metal by hand is used for feeding the drill, I made what I term a drill box in which the brace is held perfectly true and pressure is applied by a weight. The feed can be changed for the different metals and sizes of drills, also for drilling the hard outside of castings and relieving the drill for the softer body. The constant feed will cause the drill to turn out a long chip, and a number of holes may be drilled to a uniform depth by using the same feed and counting the turns of the brace handle.

To build the box, first find the dimensions of the brace, as shown in Fig. 1: the diameter of the head A, the clearance B from the top of the head to ¼ in. above the top of the handle C, and the over-all length D when the longest drill is in the brace. Make a box having an inside length equal to the dimension D, plus whatever additional height may be necessary for the work. Make the inside width twice the distance C, plus 6 in. for clearance; and the inside depth the length C, plus one-half of the dimension A, plus 3 in. Use material ⅞ in. thick and nail the parts together to form a rectangular frame. Cut a piece of broomstick as long as the dimension B, and two pieces of wood as long as the inside width of the box and as wide as the dimension B. Cut two pieces $\frac{1}{16}$ in. longer than the dimension A and as wide as the length B. Nail these latter pieces together as shown in Fig. 2, leaving a square space in the center. This frame is to be nailed inside of the top of the box flush with the front, but before doing so lay it on top of the box to determine where the center of the square space will come, and bore a hole, large enough for the round

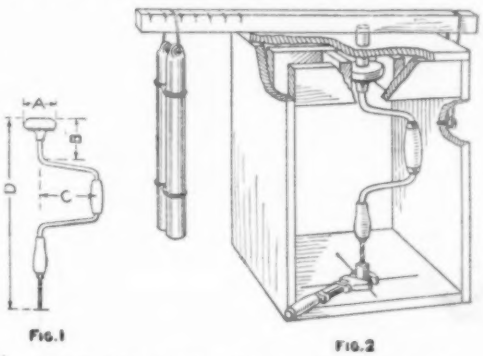


FIG. 1 FIG. 2

The Weights Apply a Constant Pressure to the Drill, Which can be Easily Turned

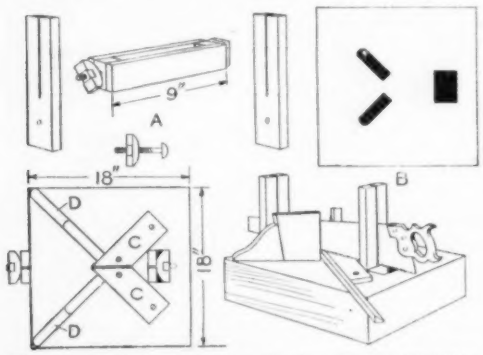
stick cut from the broom handle to slip through easily, then nail the frame on the under side of the top piece.

Procure a tough piece of wood, 1½ in. square and long enough to project 2 in. over the right and 10 in. over the left side of the box top, and when in this position, locate the hole bored for the round stick and bore a hole in the square stick, ⅛ in. deep, to coincide with it. Place the head of the brace in the guide and push it up until it touches the top of the box and block it up in this position, then drop the round stick through the hole and rest it on the head of the brace. Place the socket in the lever over the top of the round stick. Make a loop, 8 in. long, of heavy wire and hang it over the right end of the lever and mark the box at the lower end of the loop. Turn in a large screw ½ in. below this mark

allowing it to project enough to hook the loop under it. Remove the round stick and put a screw at the point the bottom of the loop reaches when the lever is flat on the top of the box. Another screw turned in between these two will be sufficient to hold the lever in position. Different-sized weights, of from 5 to 10 lb., are used on the lever, but for small drills the weight of the brace alone is sufficient.—Contributed by Maurice Coleman, W. Roxbury, Mass.

Homemade Picture-Frame Miter Box

Any person wishing to make a picture frame, or to cut down an old one, requires a miter box for that purpose,



Homemade Miter Box for Sawing Frame Molding and to Hold the Parts for Fastening Together

so that the molding may be properly held while sawing it, and also for nailing the corners together. I made a miter box, as shown, and found it to be just the thing for this purpose. It is built on a base similar to an overturned box, the saw guides being held on the ends of a piece, constructed as shown at A. Holes are cut in the top, as shown at B, for one of the guides and for the two wedges. Two pieces, C, are fastened with their outer edges at perfectly right angles on the top.

The frame parts are clamped against the pieces on top with the wedges driven in between the frame parts and the brackets DD. After cutting the frame parts they are tightly held in place while fastening them, in any manner desired.—Contributed by A. S. Thomas, Amherstburg, Can.

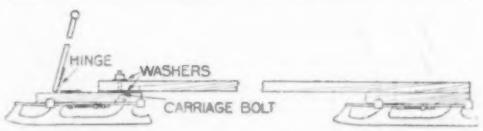
Tank-Development Methods Used in Tray Development

If there are a number of plates to be developed, place a rubber band, about ⅛ in. wide, around the ends of each plate and put them together in a tray. The bands keep the plates apart. The developer is made up as for a tank and poured over the plates, then another tray, or dark covering, is placed over the top. Allow this to stand, rocking the tray from time to time, the same length of time as is required for tank development.—Contributed by Earl R. Hastings, Corinth, Vermont.

A Pushmobile Racer for Ice

The pushmobile shown in the illustration takes the place of the one with rollers that is now so popular with the boys. The materials required, usually found about any home, consist of a foot board, 1 in. thick, 2½ in. wide and 2 ft. long; two pieces of wood, each ¾ in. thick, 2½ in. wide and 9 in. long; one steering post, 1 in. thick, 1½ in. wide and 30 in. long; one handle, 6 in. long; one small hinge; one carriage bolt, ½ in. in diameter and 2½ in. long; two ½-in. washers; a few screws, and a pair of discarded ice skates.

One of the ¾-in. thick pieces is fastened solidly to one end of the foot board with the ends flush. The other piece is swiveled with the bolt at the opposite or front end of the foot board so that at least one-half of the piece projects beyond the end. The steering post is hinged to the projecting end. The skates are fastened to the



Homemade Pushmobile, Constructed the Same as the Wheeled Kind, with Runners for Snow and Ice

¾-in. pieces for runners. The manner of propelling the racer is the same as for the pushmobile.—Contributed by W. E. Crane, Cleveland, O.

A D'Arsonval Galvanometer

A galvanometer in which the moving part of the instrument is a permanent magnet controlled by the action of the earth's magnetic field and the magnetic effect of a current in a coil of wire, that usually surrounds the magnet, has the great disadvantage of having its indications changed, although the current itself may remain constant, due to a change in the strength of the magnetic field in which the instrument operates. The operation of instruments of the above type is satisfactory only in localities where there is a practically constant magnetic field for them to operate in, which it is almost impossible to have, due to the presence of permanent and electric magnets and magnetic materials such as iron and steel.

An instrument constructed as follows will not have the above disadvantage and its operation will be a great deal more satisfactory, as its indications will be practically independent of outside disturbances. In this instrument, the moving part is the coil carrying the current, and it moves in a permanent magnetic field so strong that other disturbing magnetic effects can be neglected. The coil is hung by means of a fine wire and the twist in this wire is the only force acting to bring the coil back to its zero position, after it has been deflected, and maintain it there.

The construction of the magnet and containing case for the instrument will be taken up first. Obtain a piece of Norway iron, ½ in. square and about 9 in. long. Bend this piece into the form shown in Fig. 1, and file off the inner edges until they are parallel and about ⅞ in. apart. Drill four ⅛-in. holes in the ends of this piece, two in each end, as indicated. This piece of iron is first tempered and then magnetized by placing it in contact with a powerful electromagnet. Cut a second piece from some soft iron with dimensions corresponding to those given in Fig. 2. Drill two ⅛-in. holes, A and B, in this piece as shown in the sketch. This second piece is mounted between the poles of the magnet, as

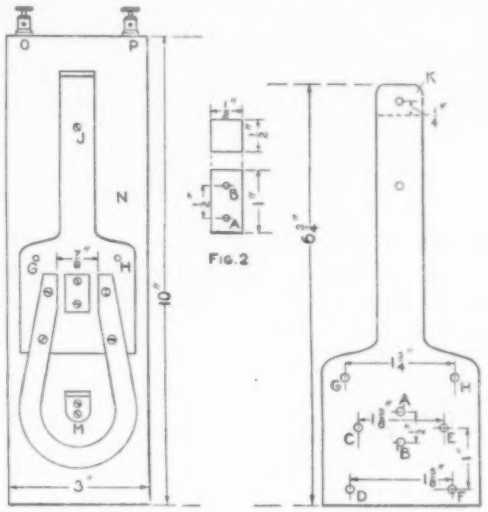
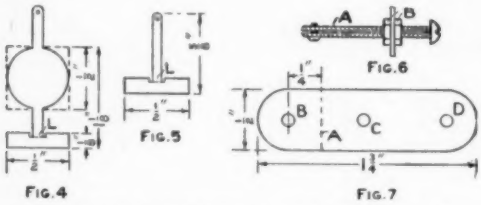


FIG. 1 FIG. 2 FIG. 3

The Permanent Magnet and Its Brass Support, and Their Position on the Base

follows: Cut from some $\frac{1}{32}$-in. sheet brass a piece similar to the one shown in Fig. 3. Drill the holes indicated and thread those designated by A, B, C, D, E, and F to take a ⅛-in. machine screw. Bend the upper end of the piece over at the point indicated by the dotted line until it is perpendicular to the lower part. The center of the hole in the projecting part K, when it is bent over, should be about ¼ in. from the outer surface of the main part of the piece. The small piece of iron is then fastened to the piece of brass with two round-headed screws that pass through the two holes in it and into the holes A and B in the brass piece. The magnet is mounted, also with small brass screws, so that the main part of the magnet and the piece of brass extend in opposite directions, as shown in Fig. 1. The assembled parts are then mounted on a wooden board, whose dimensions are given in Fig. 1, with three brass screws that pass through the holes G, H, and J, as shown.

The moving coil of the galvanometer is constructed as follows: Cut from some ⅛-in. pine a piece 1⅛ in. long and ⅝ in. wide. Cut two other



Upper and Lower Connections to the Coil and Supports, and the Supports for Suspension

pieces whose dimensions, except their thickness, are ¼ in. larger than the first piece. Then fasten these two pieces to the sides of the first, with three or four small screws through each of them, thus forming a small spool. Saw about 16 slots with a very fine saw in the edges of the projecting pieces and a short way into the edge of the center piece. Wind on this spool about 300 turns of No. 38 gauge silk-covered copper wire. Start with the terminal of the wire in the center of one end of the spool, with a few inches of free wire for making connections, and end up with the terminal in the center of the opposite end of the spool. A small thread is then passed through the slots under the coil and tied, thus serving to hold the various turns of wire together when the coil is removed from the form. The coil should be given a coat of shellac as soon as it is removed from the form.

Two pieces must now be attached to the top and bottom of the coil to be used in making electrical connections and suspending the coil. Cut from some very thin sheet brass two pieces whose dimensions correspond to those given in Figs. 4 and 5. Drill a small hole in the center of each of these pieces. Bend the lower part of each piece over at the dotted lines L until it is perpendicular to the main portion of the piece. The bent-over portions of these two pieces are then fastened to the ends of the coil with some fine thread, making sure that they are in the center of the ends before they are fastened. The terminals of the coil are now soldered to these pieces. It would be best to place a sheet or two of thin paper between the brass pieces and the coil, to prevent any part of the coil, except the ends, from coming into contact with the brass pieces. Obtain a small piece of thin mirror and mount it with some glue, as shown by the dotted lines in Fig. 4.

The upper support for the suspension is shown in Fig. 6 and consists of a ⅛-in. threaded screw, A, that passes through the hole in the part K, Fig 3, and is provided with two lock nuts, B. The lower end of this screw should be slotted a short distance, and a small screw put through it, perpendicular to the slot, so that a wire can be easily clamped in the slot by turning up the screw. Next, take a piece of $\frac{1}{32}$-in. brass, as shown in Fig. 7, and bend it at the dotted line A until it forms a right angle. The hole B should be threaded to take a ⅛-in. screw. The holes C and D are for mounting the piece on the back of the instrument. Slot the end of a ⅛-in. screw, about ½ in. long, and put a screw through the end as for the upper support for the suspension. This piece is mounted below the position the coil is to occupy, as shown by M, Fig. 1.

A case should be made for the galvanometer whose inside dimensions correspond to those of the piece N, Fig. 1, and whose depth is about ¾ in. more than the thickness of that piece. Four pieces of wood can be fastened in the corners that will allow the case to slip just far enough on the piece N to make the edge of the case and the back surface of the piece N flush. Cut an opening in the front of this case, about 2 in. long and 1 in. wide, in such a place that the center of the opening

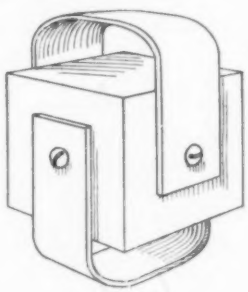


FIG.8

is about level with the ends of the magnet. Fasten, back of this opening, a piece of thin glass with four small screws whose heads rest upon the edge of the glass. The interior of this case and all the parts should be given a coat of lampblack mixed with a little vinegar. Two small binding posts, O and P, are mounted on the upper end of the piece N and connected to the upper and lower supports for the suspension of the coil.

This galvanometer will work best, of course, when it is in an exactly vertical position and the following simple device, when attached to it, will allow it to assume this position independent of the level of the surface its base may rest upon. Cut from some ⅛-in. brass two pieces, ½ in. wide and 2½ in. long. Drill a ⅛-in. hole in the center of each end of them, ¼ in. from the end, and a ¼-in. hole through the center of each. Bend these pieces to a ¾-in. radius. Cut from some ½-in. hard wood a block, 1¼ in. square. Fasten the two pieces of brass to the wooden block with ⅛-in. screws, as shown in Fig. 8. One of these pieces is fastened to the upper end of the piece N, Fig. 1, so that the galvanometer will hang vertically. The other piece is fastened to a bracket from which the galvanometer is suspended. A suitable bracket for this purpose can be easily made. When the galvanometer is hung in this way, two binding posts are mounted on the bracket, and connected to the two on the galvanometer. In this way the galvanometer will not be disturbed when making connections.

The suspension is made as follows: Take a piece of small copper wire and roll it out flat. Solder one end of a piece of this wire in the hole in the piece of brass, with the mirror mounted on it. Fasten a piece of the same wire to the lower brass piece, attached to the coil. The upper piece of wire is then clamped in the end of the screw A, Fig. 6, so that the coil hangs perfectly free about the iron core. The lower piece of wire is bent around a small rod several times and its end fastened in the slot in the lower screw.

The deflection of the instrument is read by causing a beam of light from a lamp or candle to be reflected from the mirror to a scale located in front of the instrument. If the light from the lamp is allowed to shine through a small slit in a piece of dark paper, there will be a streak of light reflected upon the scale, instead of a spot.

To use this instrument in measuring larger currents than it will safely carry, connect it in parallel with another resistance which will carry the larger part of the total current. The galvanometer can be calibrated with this resistance, which is known as a shunt.

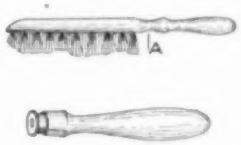
How to Make Advertising Lantern Slides

Procure some old discarded photographic films and remove the gelatin coating by soaking them in hot water. When dry, write the desired words on the thin celluloid and place it between two pieces of glass, lantern-slide size, and bind them as in making a lantern slide.

With the use of a carbon paper a very nice slide can be made by writing the words on a typewriter, and it will serve the purpose of an expensive announcement slide.—Contributed by F. P. Dickover, Atkinson, Neb.

Utilizing Old Brush Handles

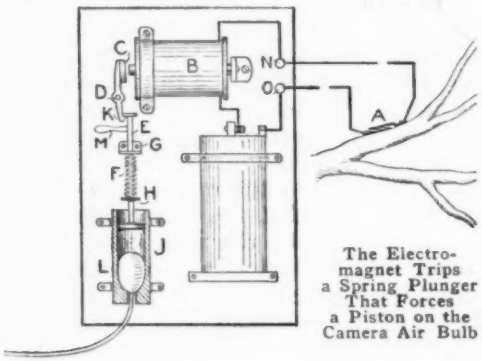
The handle cut from an old dusting brush, fitted with the brass end of a shotgun shell, makes a first-class tool handle. The handle is cut off at A and the wood cut down to fit tightly into the brass shell. —Contributed by James M. Kane, Doylestown, Pa.



¶Tincture-of-iodine stains may be removed from clothing or the skin by using strong ammonia water.

An Electrically Operated Camera Shutter

It is often quite desirable to operate the shutter of a camera from a distance, especially in photographing birds and

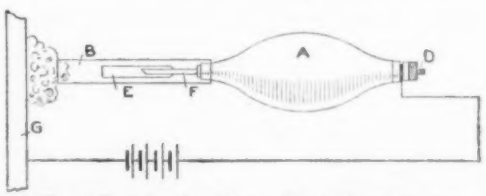


The Electromagnet Trips a Spring Plunger That Forces a Piston on the Camera Air Bulb

animals. The device shown in the accompanying sketch serves the above purpose very nicely, and its construction and operation are exceedingly simple. In brief, the operation is as follows: The switch A is mounted on the limb of a tree, in such a manner that it is not conspicuous, and connected in series with a magnet, B, and a battery by means of a piece of flexible conductor, such as lamp cord. The magnet B is energized when the switch is closed and attracts the iron armature C, which is mounted on an arm, pivoted at D. The lower end of this arm is in the form of a latch, which supports the rod E when it is raised to its upper position. The rod E when it is raised compresses the coiled spring F, which is held between the gauge G and the washer H mounted on the rod. A small coil spring holds the armature C away from the core of the magnet B. The lower end of the rod E is in the form of a piston operating in a wooden cylinder J. The rubber bulb at the end of the tube leading to the camera shutter is located in the lower end of the cylinder J. When the rod E is released by the latch K, it moves downward in the cylinder J, due to the action of the spring F, and compresses the bulb L, causing the shutter of the camera to be operated. A small handle, M, may be mounted on the rod to be used in raising it to the upper position. The component parts of this device may be mounted on a small wooden base by means of brass straps, and the terminals of the electric circuit connected to the binding posts N and O, as shown. The switch A may be dispensed with and a push button used in its place, as the operator may station himself several hundred feet away. It may be necessary to use a battery of more than one cell in such cases.

Electroplating without a Tank

Electroplating without a plating tank is made possible with the following easily homemade apparatus described in a German scientific magazine. It consists of a rubber ball, A, fitted at one end with a glass tube, B, which carries at the opposite end a small sponge. A rod, D, passes through the rubber ball, which is tightly corked at both ends, into the glass tube B and carries at that end the anode E. A small glass tube, F, also connects the rubber ball with the larger tube B. The connections from the battery to the cathode, G, the object to be plated, and to the projecting end of the anode-carrying rod, D, are made as shown. The rubber ball is filled with the electrolyte, and is squeezed so as to force the fluid



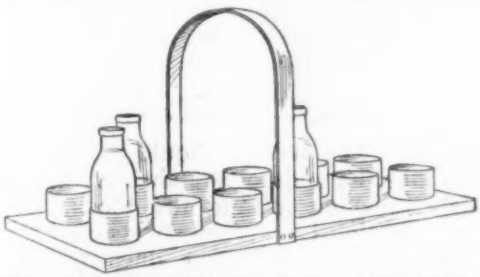
A Hand Tool for Applying a Plate Electrically to the Surface of Metal

through the small tube F, into the larger tube, B, filling it and soaking the sponge C. The current is then turned on, and by moving the wet sponge over the cathode G, the latter will be plated. Not only is this an interesting accessory for the amateur's laboratory, but it can be used in the

industry where only parts of some object are to be plated, and where it is desired to remedy bad spots without putting the articles back into the bath.

A Milk-Bottle Tray

Bottled milk is difficult to deliver without knocking the bottles together when carrying them or while in a wagon. There are several kinds of wire baskets for carrying the bottles, but they all have the disadvantage of allowing the bottles to strike one another. A carrier not having this fault can be made very cheaply as follows: Procure a board 1 in. thick, 8 in. wide and 2 ft. long, plane and make it smooth, and use ordinary tin fruit or



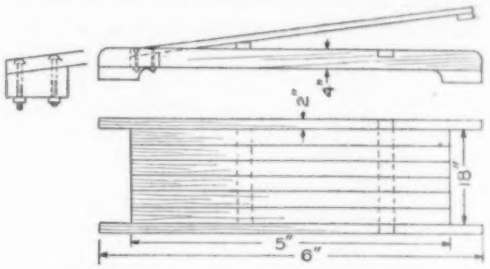
Parts of Tin Cans Fastened to a Board for Holding Milk Bottles

vegetable cans for the bottle holders. Cut each can off 2½ in. from the bottom and smooth off the jagged edges with a file. Nail these in two rows on the board, starting 1 in. from each end. Attach a segment of a barrel hoop for a handle. The carrier can be painted as desired.—Contributed by G. H. Clemmons, Storm Lake, Iowa.

A Springboard

Select straight-grained hickory or ash for the springboards. These can be of any width to make up the board to 18 in. wide. The frame part may be of any material of the dimensions given in the sketch. The butt ends of the springboard should be well fastened to the crosspiece with screws, or, better still, small carriage bolts with the nuts on the under side.

The crosspiece at the rear is cut on the angle of the springboard. The front crosspiece is mortised into the frame, and the one near the center is laid on top of the two side rails.



A Springboard for Use in Connection with a Vaulting Pole or for Turning Acts

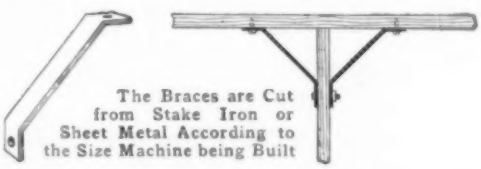
The rear crosspiece is either fastened with large dowels or mortised into the sidepieces. This springboard will be of use in connection with a back-yard gymnasium for vaulting and doing turning acts.

Planing Rough-Grain Boards

The surface of a board having a grain that runs both ways is very hard to smooth with a plane. By sharpening the plane iron to a keen edge, then placing it in the plane with the cap reversed and set about $\frac{1}{32}$ in. from the cutting edge, I find that with a light cut the plane will smooth regardless of the direction of the grain.—Contributed by William Rollins, Wichita, Kansas.

Braces for Aeroplane Frames

In making model aeroplanes or gliders the brace shown will serve the purpose admirably. The size and strength of the metal used will depend on where it is to be used. The metal is bent

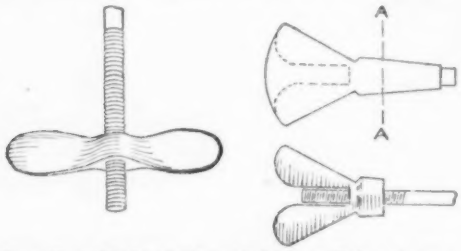


The Braces are Cut from Stake Iron or Sheet Metal According to the Size Machine being Built

into the shape shown with the use of a vise. The manner of attaching the braces is clearly shown.—Contributed by Francis Chetlain, Chicago.

Homemade Wing Nuts

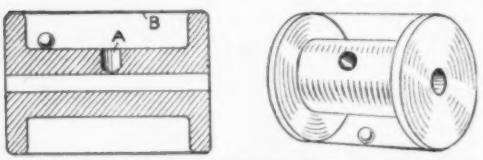
A handle taken from a worn-out faucet, drilled out and threaded for a bolt, makes a good wing nut. A discarded gas-bracket key, cut off on the line AA and with the part within the dotted lines filed out, then drilled and threaded, also makes a good wing nut.



Wing Nuts Made of Discarded Parts Taken from a Faucet or a Gas Bracket

A Spool-and-Ball Puzzle

Procure an empty basting-thread spool and make a hole in its side, at A, just large enough to receive a ¼-in. steel ball. A piece of celluloid, B, is wrapped around the flanges, as shown, and fastened with small brads. An old negative film, well cleaned, is suitable for the celluloid. Be sure to put the steel ball in before fastening the celluloid in place.



The Steel Ball is Not So Easily Run Into the Hole as It Appears

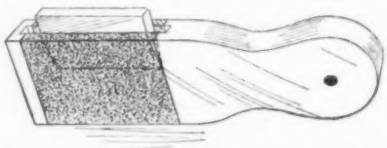
The difficulty of the puzzle is to get the ball into the hole.—Contributed by R. C. Knox, Waycross, Ga.

To Start the Ink Flowing from a Drawing Pen

In order to keep the ink flowing readily from a drawing pen it must be kept clean and not allowed to stand with the ink in the nibs. A good plan is to have a small piece of velvet fastened to the drawing board or upon a small block, conveniently located where the pen may be drawn across it as in making a line. The tuft of the velvet will clean out the partly dried ink between the nibs.—Contributed by H. L. Woodward, Washington, D. C.

A Pencil-Sharpener Stick

Do not discard the sandpaper stick or pencil sharpener used by a draftsman just because all the abrasive sheets have been removed. Make use of it indefinitely by fitting a wedge in one edge, as shown in the illustration, to hold fresh sheets of sand or emery paper. The wedge should fit tightly so that the ends of the abrasive sheet, when wound around the block, will be held tightly. Worn sheets can thus be removed and new ones applied when necessary. — Contributed by Chas. J. La Prelle, Flushing, L. I.



A Wedge Attachment for a Pencil-Sharpener Stick for Changing the Sheets of Abrasive

Splice for Round Belts

Sash cords or round belts are easily spliced with a coil spring, and for belts this joint will run smooth and noiseless. The coil should be a close fit on the belt, and after turning one end halfway into the spring, the belt itself is twisted in the reverse direction as many times as there are coils remaining in the spring, before the other end is turned into it to meet the first.—Contributed by F. S. Cummings, Detroit, Michigan.

A Coil Spring Used for Splicing Sash Cords or Small Round Belts

¶When painting wireless instruments use black asphaltum, as it has high insulating qualities.

Homemade Ellipsograph

By CHELSEA CURTIS FRASER

An efficient ellipsograph is the only device that will make true ellipses of various sizes quickly, and such a machine is in demand on some classes of work in a drafting room. Its cost, however, is prohibitive where only few ellipses are to be drawn, but a person handy with tools can make an apparatus that will do the work as well as the most expensive instrument.

The completed ellipsograph, herein described, will appear as shown in Fig. 1. It consists of two main parts, the base and the arm. The former is a hardwood piece, A, Fig. 2, to the side center of which is attached another hardwood piece, B. This latter piece may be dovetailed into A, but an ordinary butt joint will suffice, as a one-piece base, C, also of hard wood, is glued to the bottom surfaces of the pieces A and B, thus securely holding them together. Before gluing, however, care must be taken to see that the piece B is exactly at right angles with the piece A. This can be done with a try-square. Dimensions are given in Fig 2. The same letters are used throughout for the same parts.

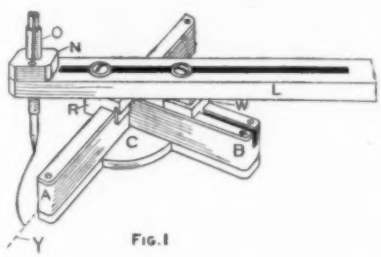


FIG. 1

Practically Any Size or Proportion of Ellipse, from 1½ to 16 In. Maximum Diameter, can be Drawn with an Instrument of This Size, and Larger Instruments will Work Equally Well

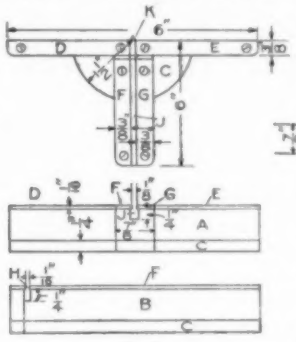


FIG. 2

A $\frac{1}{16}$-in. groove, H, is cut out at the juncture of A and B, to admit the flange of the minor-axis swivel head. Another groove, J, is made along the longitudinal center of the piece B, to receive the spine of the major-axis swivel head. Sheet brass plates, D and E, are cut from $\frac{1}{16}$-in. stock and attached to the top of the piece A with screws. The plates F and G are of the same material and fastened in a like manner to the upper surface of the piece B. All plates project slightly where they touch the groove borders, as shown. This is to provide a bearing for the projections on the sliding parts against metal instead of wood. A piece of thin celluloid or brass plate, K, is inserted in the bottom side of the base C so that the point will be exactly in line with the center groove J, and extend outward ⅛ in. This point indicates the center of all ellipses to be drawn. In the bottom of the base C, at each end, drive an ordinary pin and cut it off so that a part of it will project beyond the surface of the wood. These extending ends are pointed with a file, and serve to keep the instrument from slipping when in use.

The arm L is shown in Fig. 3. It is made of either maple or birch. Follow the dimensions given, cutting a slot through it longitudinally, as shown at M, narrower on the upper side than on the lower, the upper being ¼ in. wide. An octagon-shaped piece of wood, N, ½ in. thick, is glued to the end, to give a good seating for the sleeve O, which is a piece of ½-in. solid-brass rod, 2 in. long, drilled to receive closely the

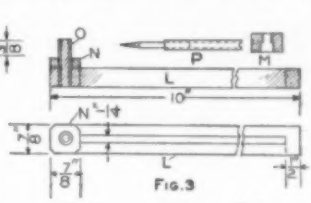


FIG. 3

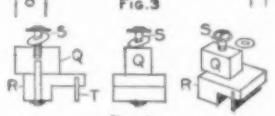


FIG. 4

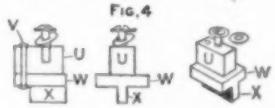


FIG. 5

pencil sheath. The latter, P, can be made from a section of brass tubing such as is used in a bicycle-pump valve. The upper end is notched to receive a rubber band, and an ordinary pencil can be cut down to fit closely into the other end. The piece O fits tightly in a hole bored through N and L.

The detail of the minor-axis swivel head is shown in Fig. 4. This swivel head consists of two pieces of brass, one, marked Q, being ⅜ in. square by ¾ in. long and the other, R, ⅞ in. square by ½ in. long, with a notch cut out as shown. These parts, as well as the somewhat similar ones for the major-axis swivel head, can be cast cheaply, or block brass may be cut with a hacksaw and filed to the right shape. A shortened dry-cell screw, S, with washer, to fit a tapped hole drilled in the piece Q, serves to bind the head where desired on the arm. The flange T is a piece of $\frac{1}{16}$-in. brass driven into a slot cut in the piece R. The piece R is pivoted to the piece Q, as shown, by means of a piece of wire nail which engages Q, by friction, the lower end being fitted with a washer and riveted loosely so that the parts will turn freely.

The major-axis swivel-head detail is shown in Fig. 5. The piece U is the same size as Q, Fig. 4, with its screw set a little farther forward to make room for the pivot V, which loosely joins U and W together. The pivot is made of a wire nail, riveted on both ends. The piece W is of brass, ½ in. thick, ¾ in. wide and ⅞ in. long. The spine X is made just thick enough to pass freely in the groove J, Fig. 2. A screw taken from a discarded dry-battery cell is used to bind the head to the arm.

To operate the ellipsograph, draw a line, Y, Fig. 1, on the paper, which is to mark the major axis of the ellipse. About midway of its length make a point to represent the center. On the latter set the point K, Fig. 2, and adjust the bottom forward edge of the base C parallel with the line Y. Set the minor-axis swivel head at such a point on the arm L that, when the latter is directly on top of the piece B, the pencil will touch the paper at a distance from the center, marked by K, equal to half the minor axis of the proposed ellipse. To secure the major axis swing the arm until it is parallel with the piece A, leaving the major-axis swivel head unset, and set it when the pencil point has been adjusted to the proper major radius.

Grasp the arm with the right hand between the swivel heads and bearing down, swing the pencil end from right to left. The rubber band will keep it constantly on the paper with even pressure. When half of the ellipse is completed detach the rubber band and reverse the instrument to the opposite side of the longitudinal line Y and draw the other half in the same manner.

Protector Cap for a Chisel Handle

The ordinary chisel handle will soon split and break under the continuous blows of a mallet. A very good and inexpensive method of preventing this is to procure an ordinary patent bottle cap and place it on the end of the handle. It is advisable to shape the end of the handle like a bottle top in order to firmly hold the cap in place.—Contributed by Bert Verne, San Diego, Cal.

Sweeping Compound

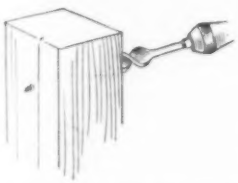
A good sweeping compound may be made as follows: Mix ½ pt. of warm paraffin oil with 2 oz. of melted paraffin wax and add 2 oz. of artificial oil of sassafras. Then pour the mixture into 10 lb. of sawdust and work the whole thoroughly together. Add to this mixture 4 lb. of clean sand and ½ lb. of coarse salt. Each article mentioned is comparatively cheap, and the compound can be kept in an open container.—Contributed by Loren Ward, Des Moines, Iowa.

Rubber Bumper on a Water Faucet

Sometimes a dish is broken by striking it on the faucet. This is easily remedied by cutting a rubber washer from a rubber-boot heel with a sharp chisel and a hammer. The washer is pushed into place on the end of the faucet, and the dishes may strike the rubber without being broken.—Contributed by Harriette I. Lockwood, Philadelphia, Pa.

Boring a Clean-Edged Hole

When boring a hole in wood, withdraw the bit as soon as the worm shows, then start the worm in the hole on the opposite side and finish boring the hole. It will then have clean edges on both sides of the wood. Often the bit pushes splinters of wood ahead of it, when passing through, but by using the method described this is avoided.



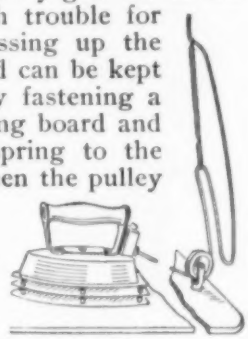
Drilling Thin Metal

In drilling very thin stock the drill, if not properly ground, will tear the metal and leave a ragged edge. To cut a hole through neatly the drill should be ground as illustrated. The center A should extend about $\frac{1}{64}$ in. beyond the points B. The point A locates the center and the sharp points B cut out the disk of metal. Holes have been neatly and quickly made with this drill grinding in metal measuring .002 in. thickness.—Contributed by Joseph J. Kolar, Maywood, Ill.

¶A pencil may be kept from falling out of the pocket by wrapping a couple of turns of tape around it or by wrapping it with a small rubber band.

Flexible-Cord Adjuster for an Electrical Flatiron

When using an electrical flatiron the flexible cord frequently gets under the iron, causing much trouble for the user, and mussing up the clothing. The cord can be kept out of the way by fastening a pulley to the ironing board and attaching a coil spring to the electric cord between the pulley and the electric-fixture socket. A coil spring that will draw out about 3 ft. should be used.—Contributed by Herbert Blandford, Elmira, N. Y.



A Wood Clothes Peg

If clothes that are slightly damp are hung on a nail or metal peg, a rust stain that is almost impossible to remove will be the result. To prevent this, drive a nail with the head removed into the wall or cleat, and place a wood peg over it. The peg may be turned up or whittled out with a pocket knife and the hole bored with a hand drill.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

To Make Scratch Pads of Old Labels

Labels and blank paper of uniform size, that would otherwise be cast aside, can be turned into handy scratch pads by placing them between blocks of wood, secured by a wood clamp, and applying paste on two edges, then pressing a strip of paper on the pasted portions. The edges to be pasted should project a trifle beyond the edges of the blocks.

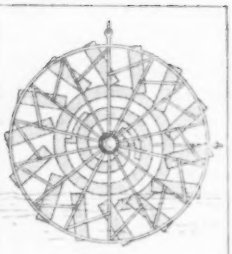


FIG. 1

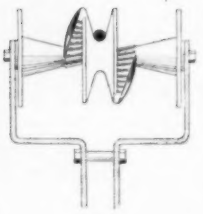


FIG. 3

FIG 5

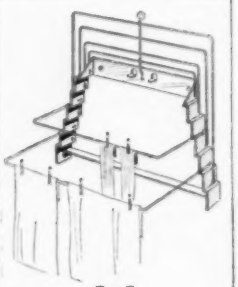


FIG 7

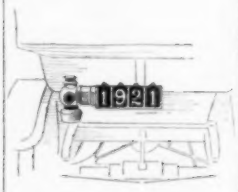


FIG. 9

INTERESTING NEW PATENTS

WHEEL FOR RAISING WATER FROM RUNNING STREAMS (Fig. 1)—The wheel is rotated by the impact of the flowing water against the paddles, and at each revolution a quantity of water is scooped up by the open end of the spiral pipe. As the wheel continues to revolve, the water follows around the pipe until it is lifted to the center of the wheel, when it passes out through the hollow shaft. The wheel may be raised or lowered to suit the stage of water.

SHOWER-BATH PAIL (Fig. 2)—This device, designed to take the place of the usual shower-bath equipment, consists of a pail with a perforated bottom above which is a solid false bottom. A buoyant stopper is used to close the opening in the center of the false bottom, and this is released by pulling the lever, to which it is attached by a cord.

SELF-PLACING TROLLEY (Fig. 3)—It is the purpose of this invention to do away with the delay and inconvenience caused when the trolley wheel of an electric car jumps from the trolley wire. When the wheel jumps from the wire the latter falls to one side on the conical shaft. With the car in motion the wire works down against the wheel, is lifted by the cam, and falls back into the groove of the wheel.

FOOT CLAMP AND BROOM HANGER FOR DUSTPAN (Fig. 4)—This wire attachment serves as a support and foot clamp when the dustpan is in use, and is provided with a small loop by which it is hung to a nail or hook when not in use. The larger loop is of such size and shape as to hold a broom securely, as shown.

OFFICE-HOUR INDICATOR (Fig. 5)—This neat and easily operated device is designed for the convenience of lawyers, physicians, and others, who are compelled to be away from their offices intermittently. The indicator portion slides on horizontal guide wires and may be shifted to make the arrow point to any hour of the day. The indicator is then fixed in position by a setscrew.

STOVE AND FURNACE LIGHTER (Fig. 6)—This lighter has a wedge-shaped tip so that it is easily forced into the coal. Along the top is a deflecting bar which holds the coal away from rows of gas orifices and prevents it from smothering the flames. In using, the lighter is connected with a gas tip by a flexible tube, the gas is turned on and lighted, and the lighter is thrust into the coal and left until the coal fire is well started.

CLOTHES RACK WITH PIVOTED HANGERS (Fig. 7; American patent by a Canadian)—One of the best features of this clothes rack is that the parts may be folded up compactly against the wall when not in use. The frame, which is designed to be attached securely to the wall, has ends consisting of a series of ledges, or steps, as shown. Each hanger consists of a U-shaped rod with ends pivoted to the ends of the frame in such a way as to be supported in the down position by two opposite ledges.

COMBINED PLOW AND HARROW (Fig. 8)—The harrow is carried on a shaft supported on the plow, and is provided with an adjustment for raising or lowering as desired. To avoid the danger of breakage, the shaft is left loose in its bearings and the harrow is held in vertical position by a spring connecting an extension of the shaft to one of the plow handles.

ILLUMINATED NUMBER PLATE (Fig. 9)—Figures are painted on glass plates which form the outer face of a hollow space. This space is illuminated by a light at one end, from which the rays are directed upon the plates through a circular flexible hood.

PAPER BOTTLE (Fig. 10)—This bottle is formed by an ingenious cutting and scoring of a single sheet of paper. One set of score lines provides for the formation of the body of the bottle, while the tapered portion and the neck are formed by a combination of vertical and diagonal cuts and score lines.

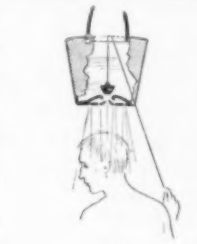


FIG 2

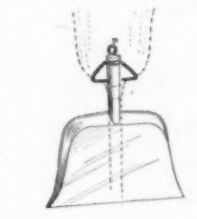


FIG 4

FIG 6

FIG 8

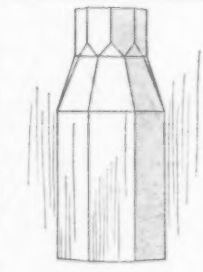


FIG.10

FIG. 11

FURNITURE CASTER WITH BALL BEARINGS (Fig. 11)—The small anti-friction balls are held in correct position by the flange of the cup casting and the curve of the main ball, which by this arrangement is free to roll in any direction. A wire retainer, attached to the casting by arms, encircles the main ball below its center and prevents it from working out of position.

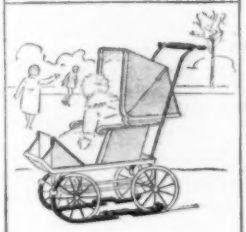


FIG. 13

TRACTION WHEEL THAT GRIPS GROUND SURFACE (Fig. 12)—This novel wheel is designed particularly for working in loose ground where a plain rim would be subject to slip. The ends of a U-shaped piece of steel are pivoted to the rim at the end of each spoke. These pieces swing down and engage the ground surface, but lie flat against the rim when at the top of the wheel. Stops are provided for limiting the swing to the proper amount.

SLED RUNNERS FOR GOCARTS (Fig. 13)—The runner is in two sections with an adjustable connection between the wheels. The front portion is curved to fit around the forward part of the front wheel and is secured in place by a clamp. The rear wheel fits into a slot in the runner, as shown, an arrangement that permits the gocart to be turned readily on the rear wheels when tilted backward.

INDICATOR FOR NOTIFYING TRADESMEN (Fig. 14; British patent)—Small cylindrical tablets, pivoted to revolve horizontally in slots in the indicator board, carry on their rims such inscriptions as "Call," "Not Today," etc. These tablets are set daily to suit the needs of the housewife, the purpose of the device being to prevent unnecessary calls by tradesmen.

FIG. 15

SECTIONAL SASH WEIGHT (Fig. 15)—The idea of this invention is the use of just enough of the sections to counterbalance the window exactly. The point of contact between two sections is a pivot that permits free swing in any direction. The hooklike form prevents displacement in one direction, while shoulders placed to engage each other prevent displacement crosswise of the sections.

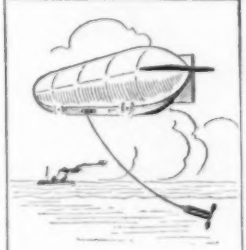


FIG 17

MOTOR VEHICLE USES PRINCIPLE OF TREADMILL (Fig. 16)—In this vehicle a motor-driven truck runs on the inner flanges of the traction wheels, climbing the front of the traction wheel as it moves forward. This throws the center of gravity ahead of the support, with the result that the traction wheel moves forward. A seat for the operator is suspended above the truck.

DEVICE FOR SECURING WATER BALLAST FOR AIRSHIPS (Fig. 17)—This device consists simply of a flexible hose carrying an automatic pump on its lower end, which is let down into the water and towed by a cable. The pump is operated by the impact of the water as the airship moves forward, and water is forced by the pump through the hose into the ballast chamber of the airship.

FIG. 19

MACHINE FOR CLEANING BOTTLES AND JARS (Fig. 18)—Water is forced into the vessel through a water pipe which terminates in a nozzle. A hollow shaft, which forms a sleeve over the water pipe, carries a collapsible frame, to the outer portions of which are attached brushes for cleaning the vessel as the shaft and frame revolve. The frame is opened or collapsed by levers that extend through the neck of the vessel.

SLED WITH FOOT SUPPORTS (Fig. 19)—The foot supports are mounted on a bar that runs transversely across the front end of the sled, and are placed in convenient position for use in coasting. The supporting surface is shaped to conform to the heel and sole of the shoe.

NOVEL FORM OF LIFEBOAT (Fig. 20)—This lifeboat is intended to be safe in any sea against danger of swamping. The main body of this boat is open at the top, the opening being protected from the ingress of water by the hood, as shown. Entrance is made through this opening, which is reached by ladders.

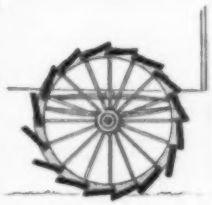


FIG. 12

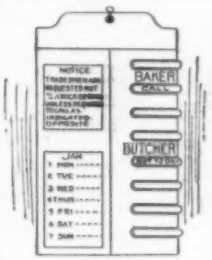


FIG. 14

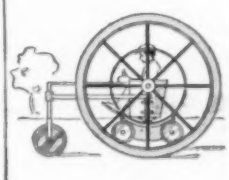


FIG 16

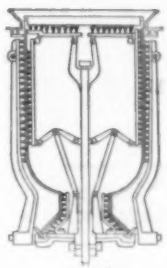


FIG 18

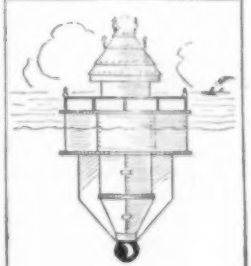
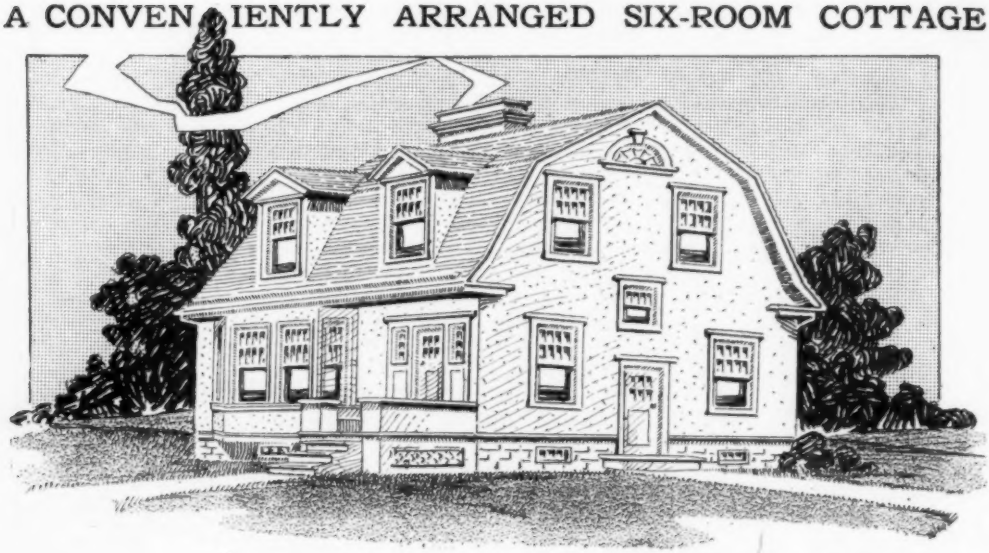


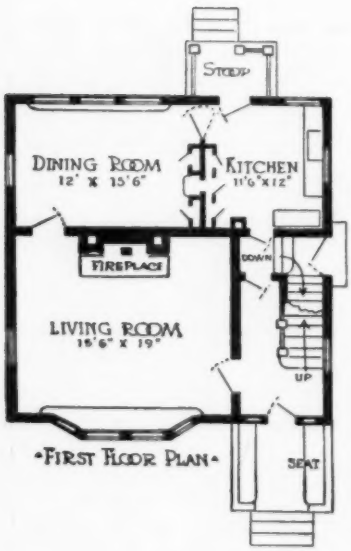
FIG. 20

A CONVENIENTLY ARRANGED SIX-ROOM COTTAGE

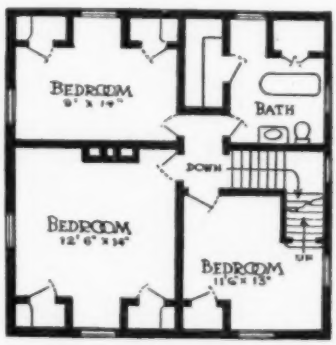


Temple & Burrows, Architects, Davenport, Iowa

View Showing Front and One Side of Six-Room Cottage



FIRST FLOOR PLAN



SECOND FLOOR PLAN

This compact and well-planned six-room cottage is an example of the result that may be secured at moderate cost in building a house suited to the typical suburban or country-town lot. The arrangement is convenient throughout and all the space in the building appears to be utilized to excellent advantage. The hallway on the first floor leads directly to the rear of the house, and from this hallway, in which the stairway to the second floor is also located, there is direct access to the living room, and through this to the dining room. On the second floor the space required for a large hallway is saved by having the doorways open on the stairway landing. All rooms, including the hallway on the first floor, are well lighted.

This cottage is of frame construction with an exterior of cement plaster laid on metal lath. The basement, which occupies all the space under the building, has concrete floor and walls, the latter extending up to the level of the first floor. The exterior woodwork of the doors, windows and cornices, as well as the shingles of the roof, is brown, a color that produces a pleasing contrast with the gray surfaces of the concrete walls. The gambrel roof with its dormer windows adds much to the general effect of the exterior while increasing the space in the bedrooms of the second floor. Stained yellow pine is used throughout for interior finish, while both stories have floors of yellow pine. One of the decorative features of the living room is the mantel, built of red paving brick with oak shelf. The building is heated by a hot-air furnace, is fully provided with plumbing, and is wired for electric lighting. The cost of this building fully equipped was $4,100.